DOCUMENT RESUME

ED 024 235 EF 002 291

Existing Schools, Their Future. Upgraded Schoolhouses with Fallout Protection.
Utah Univ., Salt Lake City. Dept. of Architecture.
Spons Agency-Office of Civil Defense (DOD), Washington, D.C.
Report No-TR-53
Pub Date Oct 68
Note-79p.
EDRS Price MF-$0.50 HC-$4.05
Descriptors-*Civil Defense, Educational Environment, *Educational Facilities, *Elementary Schools, *Fallout Shelters, Flexible Facilities, *High Schools, School Design, School Improvement, Space Utilization

Educational environment in California has evolved from the one-room schoolhouse to the two-story center corridor building with self-contained classrooms, to the "finger-plan" arrangement and more recently to the large enclosed shell of flexible teaching space. Existing facilities must be remodeled to carry on the educational process for earthquake resistance, and for fallout protection. Residential areas, where schools are located, are deficient in shelters. Fallout protection can be achieved in schoolhouse design without impairing the educational intent and without excessive cost. Remodeling should also include improved library facilities, media center, and special facilities. Studies were made of six existing schools in California. Burton Elementary School serves grades K-8 in semi-rural surroundings, and enrollment should increase to 1,000. Sacramento High School is akin to "campus-type" plan arrangement of 14 buildings. Enrollment is 2,500. Marie A. Murphy Elementary School is a "finger-plan" school. Future enrollment after remodeling will be 780. Alessandro Elementary School will serve 700 in grades K-6. Edison High School is projected for 1,400 pupils, grades 10-12. Raphael Weill Elementary School is planned for 950 enrollment, K-6. (LD)

existing schools: their future

UPGRADED SCHOOLHOUSES WITH FALLOUT PROTECTION

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
EDO 24235
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

EF002291

A design study conducted by the Division of Community and Urban Development and Department of Architecture, The University of Utah, Salt Lake City, Utah

Conducted under contract with the Office of Civil Defense, Department of Defense, Washington, D.C.

Program Director: Delbert B. Ward, Associate Professor of Architecture, The University of Utah

Educational Consultant and Program Advisor: Charles D. Gibson, Hon. AIA, Chief, Bureau of School Planning, California Department of Education, Sacramento, California

OCD Project Officer and Program Advisor: Robert Berne, AIA, Chief Architect, Office of Civil Defense, Department of Defense, Washington, D.C.

Educational change from self-contained classroom (front cover) to flexible teaching space (right)

Educational changes and existing schools

Teaching methods change over the years, reflecting shifts in educational philosophies, cultural values and technological advancement. This is as it should be. Accommodation of these educational changes in newly designed schools is readily achieved. Evaluation of schoolhouse types shows that educational philosophies are reflected in the buildings designed to house the students. These changes are reflected in the forms of existing school plants, which across the years have shifted from the one-room schoolhouse to the two-story center corridor building with self-contained classrooms, to the "finger-plan" arrangement, to the "campus-plan" arrangement, and more recently to the large, enclosed shell of flexible teaching space.

But, with today's new thoughts on the best educational methods and philosophies, what of the existing schoolhouses, conceived and constructed to satisfy the needs of a previous educational philosophy? Are new teaching-learning methods to occur in facilities arranged for another method? Are the older schoolhouses to limit educational methods to those for which the facilities were designed? And what of expansion needs for older plants? Are these to be extensions of space of the original type, or are they to be designed to allow for the newer methods? Are the educational experiences possible through recent technological advances to be limited only to pupils in newly designed schools? There appear to be no single answers to these questions which are guiding educational facilities planners. The evidence throughout the nation is that all of the courses suggested above are, in fact, happening with existing schoolhouses.

Technological change extends beyond influence on teaching-learning methods. The design of schoolhouse facilities must take into consideration not only the broadened spectrum of equipment but also the rapid changes made in this equipment. Existing facilities rarely are designed to accommodate this kind of replacement. The nuclear age, with its new horizons — and its hazards — is another aspect of the influence of technological change on school systems.

The challenge to our school systems is to carry on that educational process which is deemed most viable. Of practical necessity, this must be done in existing as well as new facilities; both must permit educational equality for the known methods of today and the unknown of tomorrow. To achieve this for education in existing plants with their restrictive physical conditions becomes increasingly important, increasingly necessary, but at the same time increasingly difficult.

About the study

This study represents an effort on the part of three groups — namely California's Bureau of School Planning, the Office of Civil Defense, and architects at the University of Utah – to examine the potentials and implications in revitalizing existing schoolhouses in order that they might better serve our communities. The participating groups, each with its particular interests, coordinated their efforts in developing improved and updated educational environments, improved facility design, and provision of fallout protection for several existing schoolhouses in the State of California.

The approach taken and the process by which the study was made are unique in program efforts of the Office of Civil Defense, the funding agency for the study. The study effort goes beyond mere exploration of means for achieving fallout protection under difficult conditions in California. Those involved in the program are seeking more than fallout protection ideas for today's educational facilities. The real challenge and the subject of principal attention has been to do this for existing educational facilities as they might be, facilities allowing for the richest possible educational experience. Great effort, then, has been given to determining and developing the best possible educational environments for these schools as well as to the direction in which educational facilities planning ought to be heading. Fallout protection for these schools was examined within this broader context.

Unlike many architectural design competitions and many design programs prepared for study purposes, which are hypothetical and allow freedom of artistic expression, this investigation of schoolhousing in California faced the hard facts of restrictive conditions imposed by existing plants and the real conditions of tight finance. The study programs were undertaken within a framework of actual situations, but particular case studies were selected for their commonness with schoolhouse problems throughout the State of California. If anything, the architects faced greater challenge in arriving at stimulating but valid design solutions with these real restraints than they would have faced in a hypothetical type of study.

Development of the design programs for the six schools which were studied was, perhaps, the key to validation of the program effort. Whether or not the studies shown in this publication have achieved the program objectives awaits evaluation. Program development was a collaborative effort of educational facilities planners, school district educational and plant administrators and the architects with their design teams who later faced the task of refining them. Involvement of all these groups in the preparation of design programs was deemed both desirable and necessary if we were to accurately ascertain educational needs of the future and problems of today. This collaborative process proved beneficial in providing practical direction for the total study.

Through involvement of educational facilities planners, we gained the best possible thinking on what educational environments ought to be, on the services that schools of the future must provide, and on spatial relationships held to be essential to improved teaching-learning experiences.

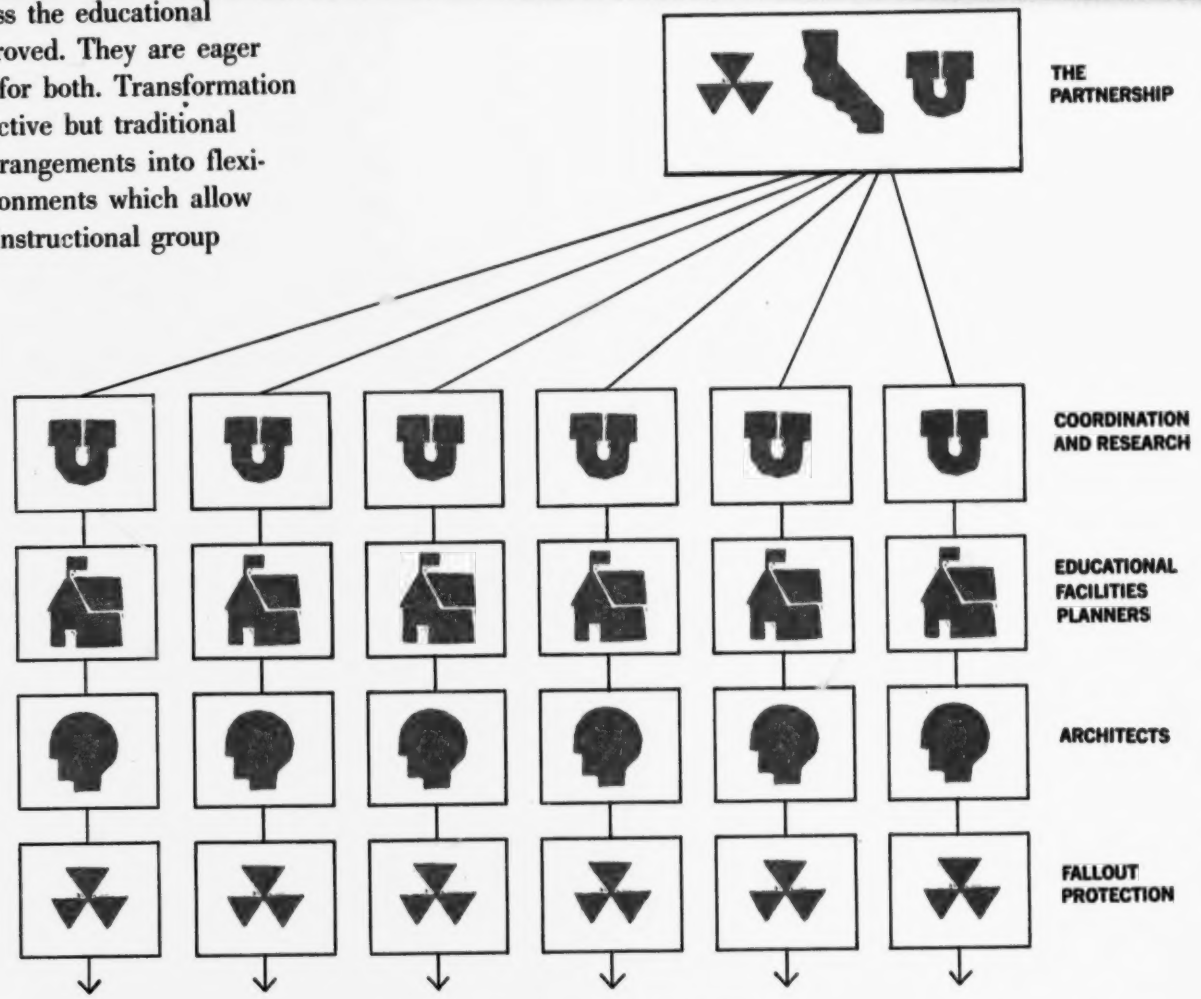
One highlight of the preliminary programming phase was a conference held in October of 1967, in which prominent and respected facilities planners sat together with representatives of the Office of Civil Defense and architectural faculty of the University of Utah to explore the needs of education and the facilities required to satisfy those needs. It was in this conference that a basic educational responsibility of the school systems for increased orientation to community service was stressed. Extended community service was stated as a need and obligation of the school systems; some already is in embryonic development many places in the Nation. All of

the six project studies selected were later to show that this school function indeed needs attention, in that all six districts identified expanded community programs as a part of each of the six specific schools' future educational programs.

Another educational facilities void in need of considerable study is that of school libraries — or media centers as they are now more popularly known. Among aspects of libraries needing fresh evaluation are the relationships of the media to the students and also the expanded services to be provided by the libraries. As was later discovered in working with the school districts, the need for improved library facilities in existing schoolhouses is pronounced from elementary through senior high schools.

Participation by school district administrators brought to the study those realities of fixed conditions, extensive program needs and budget limitations which can be adequately understood only by persons who daily face such things. Care was exercised in bringing into the study only those forward-looking districts with willingness to plunge into heretofore unexplored possibilities for upgrading existing facilities, but these were to be found in abundance. The pressing demands on school districts to improve many older facilities are by no means limited only to a few in California.

Involvement of the six districts with their six schools eventually to serve as the study instruments brought into sharp focus several recognized problems in existing educational housing in the State. Perhaps the greatest of these problems is the impact of 1967 State legislation reaffirming a requirement for structural conformity of pre-1933 buildings with earthquake resistance criteria. As noted in descriptions of several of the case studies in this publication, implications of this legislation extend to more than 50% of the schoolhouses in some of California's urban districts. School administrators recognize that extensive and costly structural modifications logically cannot be made unless the educational environments also are improved. They are eager to explore the possibilities for both. Transformation of old buildings with restrictive but traditional self-contained classroom arrangements into flexible teaching-learning environments which allow for a variety of activities, instructional group



EDUCATIONAL FACILITIES PLANNED FOR THE FUTURE

sizes and group arrangements is a need currently receiving great attention from district administrators.

District administrators also acknowledge that increasing responsibilities lie ahead for the school systems in providing educational facilities for use by the entire neighborhoods and communities which they serve — not only academic programs for K-12 pupils but social services, preschool programs, post high school adult educational and vocational programs, and general recreational programs. Most of these wider community services appear in the specific school educational programs of the six projects included in this study. Noteworthy is the fact that the extent of these programs appears to correlate closely with the urban relationship of each school.

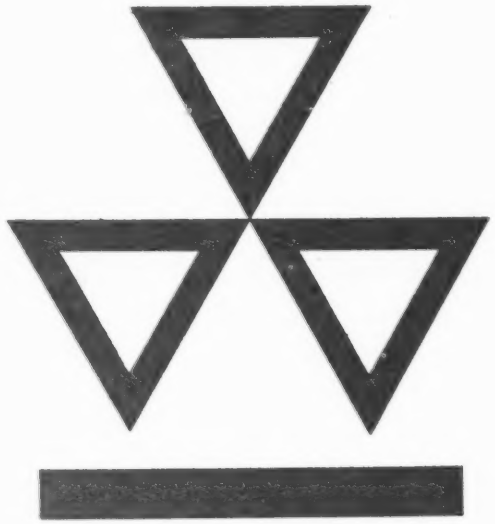
Refinement of educational needs into acceptable and meaningful programs for facilities was the ultimate responsibility of the architects and their student teams. Potentials for adaptation of existing buildings and expansion for needed facilities within existing site conditions finally became a problem of design. The considerations and possibilities for fallout protection also were examined carefully at this point.

The design phase was carried out in facilities of the University's Department of Architecture. Early in the spring of 1968, six prominent architects from across the Nation were brought to the campus, where they joined with teams of five students each to undertake the design studies. After an initial programming and preliminary study phase of two weeks, the architects returned to their respective offices for an interim "thinking" period; they came again to the campus in May of 1968 to develop final drawings and models of their projects.

The first two-week period was used to orient architects to future educational facilities planning concepts, general information on fallout radiation hazards and shielding principles, and specific considerations for the six study projects. Staff members of California's Bureau of School Planning contributed their best thinking on planning of educational facilities; staff from the Office of Civil Defense joined with University faculty to offer briefings on fallout protection; school district personnel closely acquainted with the six specific school situations and district concerns were brought to the campus to collaborate with the architects. These orientation sessions all were organized to complement the information and concepts gained previously in discussions with the educational facilities planners.

Consideration of fallout protection came into the separate studies in a definite way only after the educational considerations had received their due attention. This was an objective of the study effort — to demonstrate that fallout protection can be achieved in schoolhouse design without impairing the educational intent and without excessive cost. Educational facilities planners in California's Bureau of School Planning, collaborating closely on all phases of the total study, made sure that educational concerns received primary and proper attention. The investigators in this study believe that the objective has been achieved in the six case studies for upgrading of existing plants that follow.

These solutions for the six separate California schools are intended as examples to point a way for the upgrading of existing schoolhouses rather than as specific solutions. It may be that the several participating districts will adopt many of the ideas, because another basis for involvement of these districts was a serious interest in following through. More important, however, is the point that these solutions proposed are representative of situations abundant in schoolhouses in California and elsewhere, solutions which can contribute to the improved design of educational facilities that meet some of the new threats of this nuclear age.



Fallout protection

This Nation's leadership continues to develop and refine our ability to resist and survive nuclear attack. In this effort, the fallout shelter program of the Office of Civil Defense retains its high priority as the most effective means, per dollar invested, of protecting the population from the hazard of radioactive fallout which could accompany a nuclear attack. A fallout-protected space for each of this Nation's inhabitants, wherever he might be, remains the goal of the Office of Civil Defense.

A National Fallout Shelter Survey was undertaken in 1961 to inventory the then existing shelter space throughout the Nation. That program has continued through the years with regular updating, and it has been supplemented by other programs that encourage the incorporation of shelter in new construction by both the private and public sectors of the country. That the private and public sectors have responded to this challenge is evidenced by the following statistical compilations taken from the survey records. In 1963, the first year of record from the survey, 104 million shelter spaces having a protection factor of 40 or more were identified. In 1964, the number of shelter spaces had been increased to 121 million, in 1965 to 136 million spaces, in 1966 to 150 million spaces, and in 1967 to more than 160 million spaces. Progress has been made, but the goal of a shelter space for every person, wherever he might be, has yet to be reached.

Not only is the amount of available shelter space important, but location of protected space relative to the population also is of equal concern. The Community Shelter Planning Program of the Office of Civil Defense aims at correlating shelter space with population distribution. Areas of shelter deficit are being identified, alternatives are being provided for optimum use of available fallout protected space, and plans are being prepared for efficient population movement to the protected spaces in the event of emergency. Through this program, accurate and meaningful information becomes available to the public and private sectors for development of additional shelter space in areas of greatest need.

The widely recognized relationship between population concentration and schoolhouse locations has encouraged consideration of schools as potential shelters. Their locations in residential neighborhoods become all the more significant when statistics from the National Fallout Shelter Survey and the Community Shelter Planning Program are examined in detail. These statistics show that the shelter deficit areas invariably are located in the residential neighborhoods of our cities and suburbs. It happens that these areas also coincide with where the schools are normally located in order to serve the population more effectively. Thus, a significant resource is identified to help increase the shelter inventory for the Nation.

Achieving fallout protection in schoolhouses requires imagination and design skill, if the shelter is to occur in proper perspective with respect to the primary educational intent of the facilities. The degree of past success in designing fallout protection into schoolhouses has varied substantially throughout the country, since plant layout and type of building construction, which influence the ease for gaining protection, vary from State to State and from region to region. However, because of the potential significance of their protective nature, schoolhouses continue to be a subject of intensive study as means are sought to achieve the most feasible — and educationally acceptable — fallout protection in these buildings.

The six studies shown in this publication are an attempt to provide ideas on but one aspect of achieving fallout protection in schools — namely, application to existing schoolhouses which may need to undergo future physical change either through rehabilitation or expansion. The studies present some choices for solution of the same basic problems and also cover several types of building situations. Because some educational aspects of the study apply to new school construction as well as to existing schools, it may be that some fallout protection aspects are equally valid in new schoolhouse design.

Existing schools in California

California's school districts, as is true with most in the Nation, rarely have been successful in planning educationally complete and adequate plants for initial construction. An inability to accurately predict enrollments, limited initial construction funds, legal limitations on allowable space, and inflexible planning of facilities which cannot be readily changed to meet new educational program needs are among the many reasons for this lack of success. Upon examination of the conditions which cry out for changes to be made in existing plants, one begins to doubt that the pattern can be altered. Acknowledging that change in educational methods is inevitable and that unknowns — or absence of foresight — also inevitably create a need for changes in physical plants, educational facilities planners are giving increased attention to masterplanning schoolhouses for future enlargement and developing greater flexibility in those facilities which are being constructed.

Educational change and the consequent need for thorough, thoughtful investigation of ways to update schoolhouses are problems not unique just to California, except, perhaps, that the Nation's most populous State has more schools than most other States. Still, concern about changes in present schoolhouses seems to be more immediate and receives greater attention today in California than in many other States. This unquestionably is traceable to a number of historical happenings; two of these are of particular relevancy.

State legislative action taken in 1967 will have far-reaching effects on many old schoolhouses in California. Assembly Bill 450 reaffirms earlier legislative intent that all schoolhouses constructed prior to 1933 be examined as to their structural soundness for earthquake resistance. It further requires that those school buildings determined to be potentially unsafe be structurally upgraded or replaced following a plan of action to be developed not later than January 1, 1970. Schoolhouses in California constructed after 1933 were required by law to meet specified safety standards related to earthquake resistance. Those constructed prior to 1933 were not. Therefore, California presently has a dual level of safety for its school children. The intent of recent legislative action is to correct this dual standard.

The effects of this bill are extensive. Estimates on replacement costs for these pre-1933 schools range from $400 million to $1.1 billion, covering more than 2,000 existing schoolhouses in the State. The effects are most notable in urban centers where a high percentage of the schools was constructed prior to 1933. For example, in San Francisco about 50% of the schoolhouses will require structural modifications; in Sacramento the number is 20 out of 77 schools; in San Bernardino 37 out of 56 schools are affected. In some instances the required structural rehabilitation will be so extensive as to encourage abandonment and replacement of plants. In other instances, the required structural rehabilitation will be so extensive that the cost to rebuild encourages simultaneous upgrading of the educational environments. Some schoolhouses can be structurally corrected with minimal modification of the buildings but always at considerable cost.

This legislative action has encouraged widespread educational reevaluation in California as the school districts inventory their situations. This reevaluation, fortunately, has been directed to gaining optimum educational environments commensurate with the reconstruction required in each instance.

The second important influence on educational facilities planning in California relates to the State's rapid post-World War II growth. The rapid increase in California's population over the past three decades has brought about an enormous demand for new educational plants. This great need for facilities, however, has placed a great financial burden on the districts and the State. This, in turn, has led to stringent limitations on construction in State-aided districts in order to discourage excesses and to spread out the limited financial resources. One result of these limitations has been innovative schoolhouse design which makes maximum use of space. But another result has been minimal facilities to carry out educational objectives. The outside-corridor, "finger-plan" schoolhouse, consisting only of rows of self-contained classrooms, is one manifestation of this situation. However, the historic pattern of constructing only self-contained classrooms is found more and more to offer inadequate educational facilities. Pressures are increasing for improved library facilities plus all that is implied in the concept of media centers, for more flexible teaching space that can be used in a variety of ways and for a variety of group sizes, and for special facilities for an increasingly broad range of special education programs to serve the educationally handicapped and the socially impeded.

Extensive research into patterns of schoolhouse additions in California, done at the initial stages of this design study, revealed some indications of the extent and nature of new facilities added to existing schoolhouses. School construction records for State-aided districts for the period of 1954-1967 were examined; they are the source of the following findings. Of the 58 counties in the State, representing more than 1,000 school districts and 6,569 schools, the records show that 2,648 separate additions occurred in the 14-year period. Though the non-State-aided district figures are not included in this number, it represents a little more than 25% of all schools in the State which were expanded during this period of time. Remodelings and alterations to existing plants were not checked.

The same records in the California State Department of Education also carry information as to the nature of space types which were added and the area for each type. New additions in one large county in the State were examined in depth to establish trends in types of facilities constructed as additions to existing plants. One thing examined was the frequency with which space types were added. Frequency of occurrence statistics show that one of every 1.38 additions during the 14-year period included classroom space, one of every 3.07 additions included a multiuse type of space, one of every 4.72 additions included administrative space, one of every 4.83

additions included a library, and one of every 4.83 additions included a new kitchen and serving facilities. These frequencies were later examined on two-year intervals to determine changing trends in facilities construction. A similar sampling for the same county was taken to establish average floor areas of new additions. The data show that the average school addition has an area of 9,375 sq. ft. Average classroom area, when classroom space occurs, is 5,106 sq. ft. Average multiuse space area is 2,946 sq. ft., average administrative area is 1,256 sq. ft., and average library area is 1,482 sq. ft., when they occur.

From data of this kind, the pattern of past schoolhouse additions is clarified. While the intended use for this material was not to establish which facilities school districts should build, the information was definitely useful in guiding the educational planners and programmers, since it reflects those presently inadequate conditions in existing schoolhouses. In a sense, the material was used to validate the educational program directions for this study, recommended by the facilities planners and school districts. Thus, these statistics were not used to establish what the optimum educational environment might be, but were acknowledged as representative and reasonable determinants of future schoolhouse facilities.

These, then, are some of the situations in California's existing schools with which school facilities planners are grappling today. This design study is, in large part, developed around these real and pressing problems.

Design study statistical summary

	BURTON ELEMENTARY SCHOOL	SACRAMENTO HIGH SCHOOL	MARIE A. MURPHY ELEMENTARY SCHOOL	ALESSANDRO ELEMENTARY SCHOOL	EDISON HIGH SCHOOL	RAPHAEL WEILL ELEMENTARY SCHOOL
Grades Presently Served	K-8	10-12	K-6	4-6	10-12	K-6
Grades to be Served	K-8	10-12	K-6	K-6	10-12	K-6
Present Enrollment	500	2,500	550	415	1,100	750
Projected Optimum Enrollment	1,000	1,750	780	700	1,400	790 K-6 + 160 Preschool
Existing Schoolhouse Area	29,549 sq. ft.	344,547 sq. ft.	37,443 sq. ft.	27,448 sq. ft.	152,546 sq. ft.	74,120 sq. ft.
Proposed New Schoolhouse Area	**65,749 sq. ft.**	**325,117 sq. ft.**	**48,669 sq. ft.**	**45,907 sq. ft.**	**177,200 sq. ft.**	**97,920 sq. ft.**
Existing Schoolhouse Area Per Pupil	59.10 sq. ft.	137.81 sq. ft.	68.08 sq. ft.	59.70 sq. ft.	138.68 sq. ft.	98.83 sq. ft.
Proposed Schoolhouse Area Per Pupil	**65.75 sq. ft.**	**185.78 sq. ft.**	**62.40 sq. ft.**	**65.56 sq. ft.**	**126.57 sq. ft.**	**103.07 sq. ft.**
Shelter Area	7,223 sq. ft.	21,357 sq. ft.	8,582 sq. ft.	6,564 sq. ft.	17,358 sq. ft.	13,558 sq. ft.
Shelter Capacity	**715 persons**	**2,134 persons**	**858 persons**	**656 persons**	**1,735 persons**	**1,355 persons**
Protection Factor	42	Varies 40 to 80	40	40	50	Varies 40 to 100
Normal Daily Use of Shelter Area	Multipurpose & Industrial Arts-Fine Arts-Homemaking Classrooms	Cafeteria, Shop Service and Performing Arts Areas	Flexible Teaching Area	Multi-purpose Space	Cafeteria, Locker Rooms and Kitchen	Multipurpose Area and Administration
Total Estimated Construction Cost[1]						
Without Fallout Protection	$435,731.00	$1,765,146.00	$395,264.00	$638,801.00	$1,166,644.00	$1,019,274.00
With Fallout Protection[2]	458,058.00	1,772,506.00	429,276.00	652,692.00	1,172,025.00	1,019,274.00
Cost For Fallout Protection	**$22,327.00**	**$7,360.00**	**$34,012.00**	**$13,891.00**	**$5,381.00**	**$0.00**
Square Foot Cost For Fallout Protection[3]						
Based Upon Total Schoolhouse Area	$ 0.34	$ 0.02	$ 0.70	$ 0.27	$ 0.02	$ 0.00
Based Upon New Construction Area	0.62	0.09	1.65	0.54	0.07	0.00
Based Upon Fallout Protected Buildings	1.48	0.12	----	1.46	0.09	0.00
Based Upon Shelter Areas	3.02	0.53	3.96	2.12	0.31	0.00

[1]Construction costs always are a controversial issue, and rarely will two separately prepared estimates for the same project agree. The estimated costs shown here are believed to be representative of the plans renovations and additions shown in the six schemes. Cost estimates were prepared from quantity surveys corrected for California building indexes. Estimates include overhead and profit for contractors plus insurance. For all schemes heating was included but no air-conditioning. Carpets for teaching spaces are included in the estimates for all schemes.

[2]Cost estimates for fallout protection were determined by taking the difference between two separate and complete quantity surveys for each project, one without fallout protection based upon the most suitable and economical construction for each scheme, and one with fallout prosection based upon design modifications made to achieve the shelter.

[3]Unit costs for construction can be prepared in many ways. Unit costs for alterations and additions are even more complicated. In cognisance of this, unit costs for gaining fallout protection in the six schemes were determined in four ways in an effort to clarify the construction

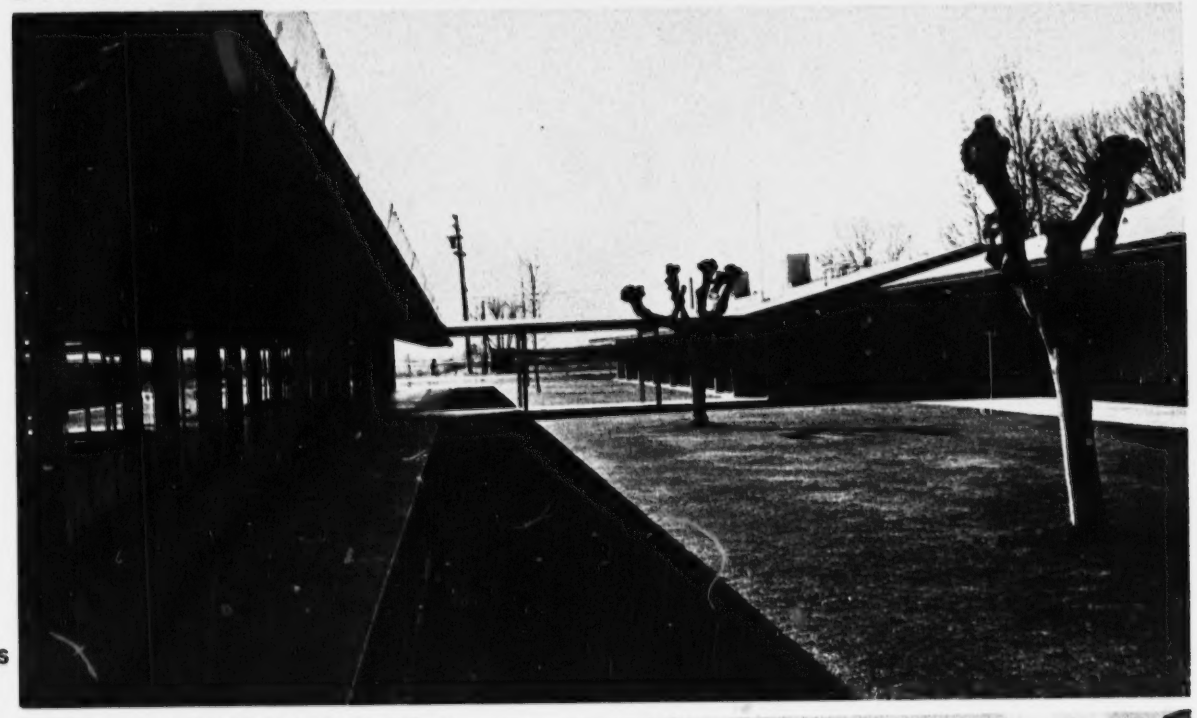
About the architect

J. MARTIN ROSSE, AIA, has headed his own firm in San Francisco since 1955. A graduate of Massachusetts Institute of Technology, Rosse was recipient of the Rotch Traveling Scholarship in 1941. His professional work shows a strong and similar styling long associated with practitioners in the Bay Region. His work has included numerous California schools. The Northern California Chapter of AIA acknowledged Rosse's schoolhouse design skill with an Award of Merit in 1963 for the Corte Madera School, Portola Valley, California, a joint venture project with Charles Warren Callister. Rosse's work has been widely published in *Architectural Record, Architectural Forum, Western Architect and Engineer, Architecture/West, Sunset, Interiors,* and Educational Facilities Laboratory Publications on *Middle Schools,* and *Schools Without Walls.* His work has been widely exhibited from the Oakland Art Museum to the Architectural League of New York. Most of these recognitions were for schools. Clearly, Rosse offers skill and unparalleled previous involvement in schoolhouse design for this study.

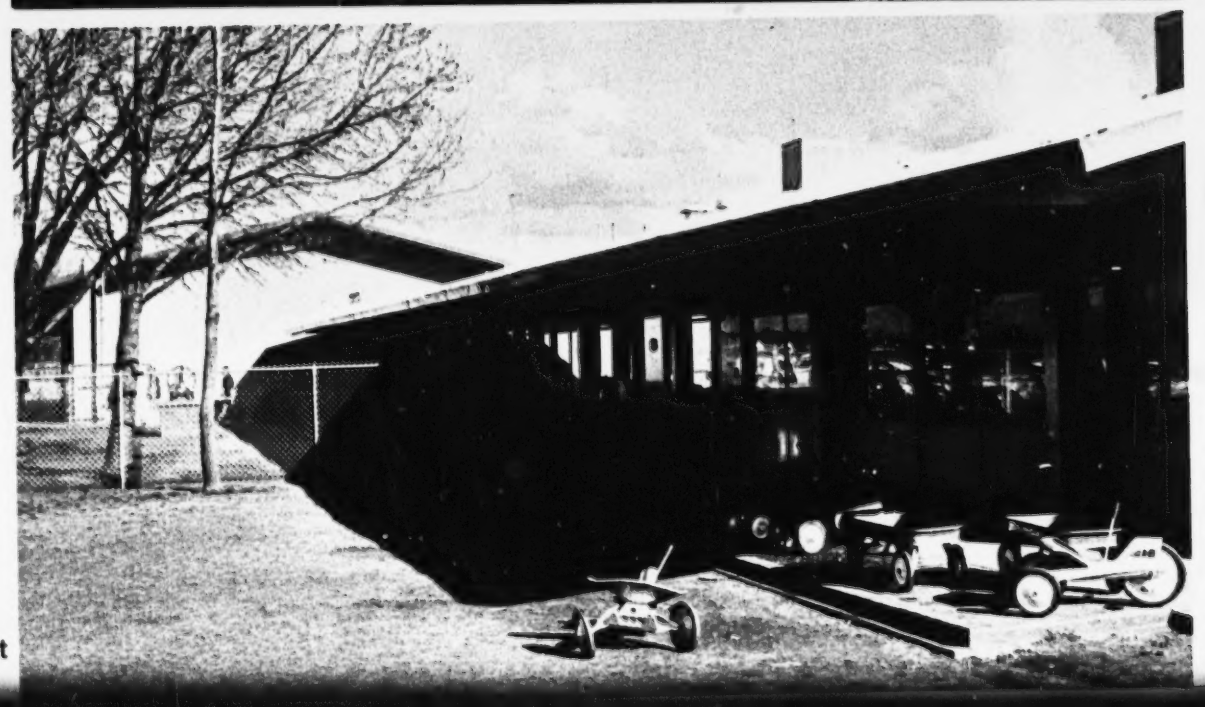
Project Educational Consultant:
Victor J. Bergthold
Superintendent
Burton Elementary School District

Student Design Team:
Wayne Bingham
Terry Hilton
Joe Linton
Duncan Moyes
Michael Stransky

BURTON ELEMENTARY SCHOOL Burton Elementary School District Porterville, California

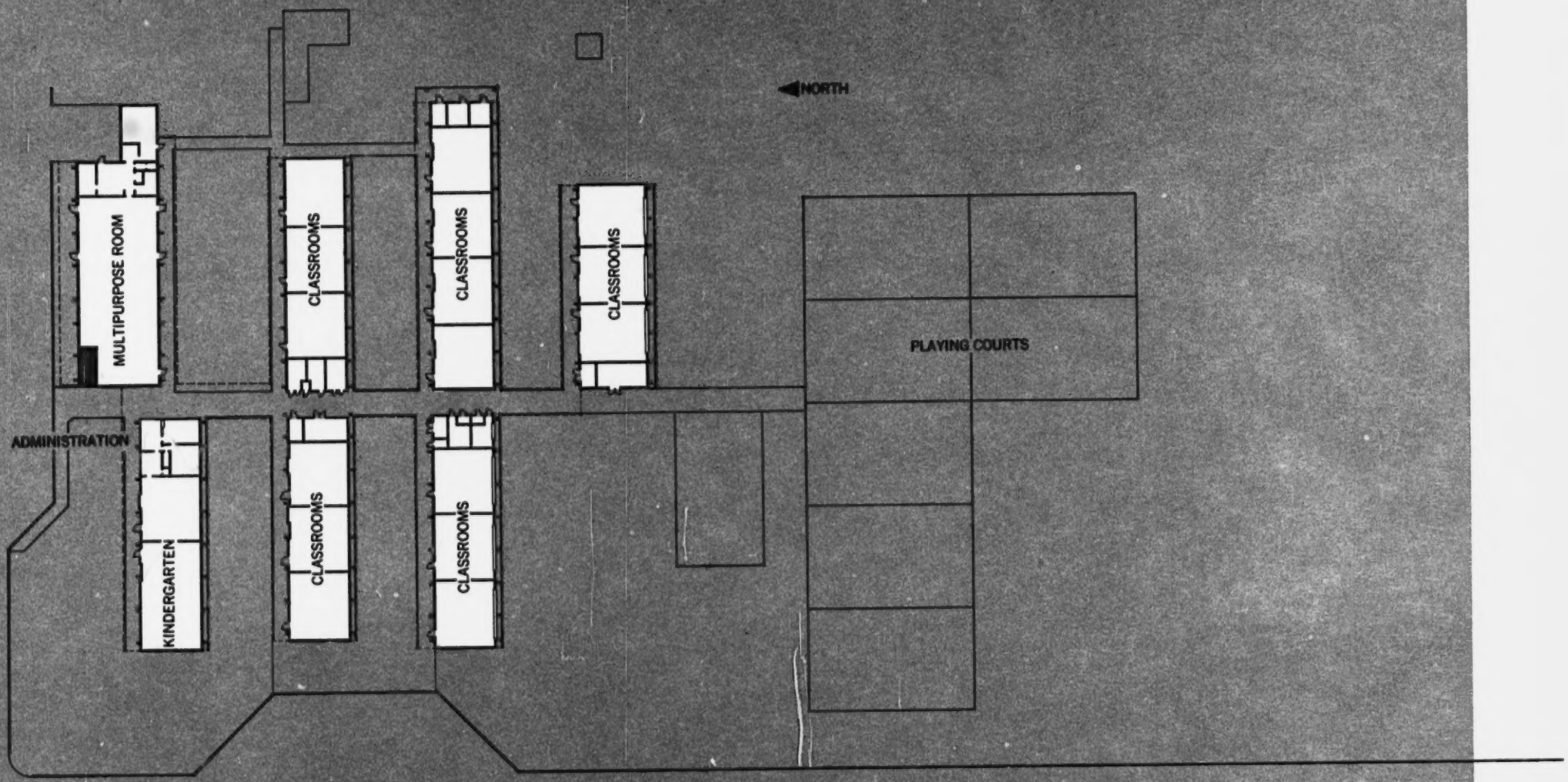


Court between wings of "finger-plan"

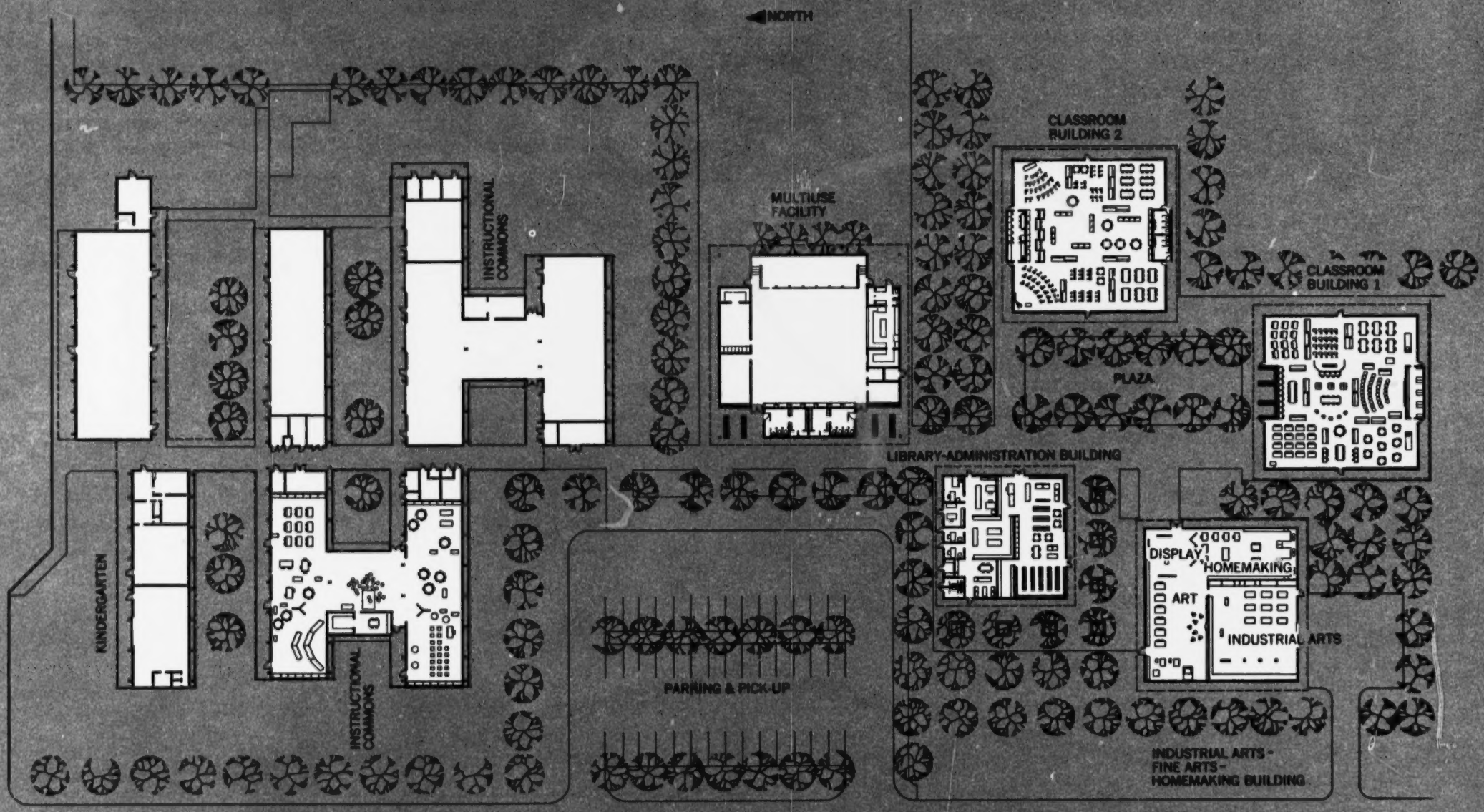


Kindergarten unit

Existing schoolhouse



Proposed schoolhouse



About the project

From his office in San Francisco, Rosse came to this study with in-depth understanding of how to design schoolhouses within the stringent conditions of California's State-aided financing program. Yet, the schools emanating from his office reveal imaginative, progressive and economical solutions to the problems found in facilities for learning. His solution for expansion of the existing Burton Elementary School conveys his perception of changing educational facility needs, yet retains the humanizing spatial quality evident in his past work.

Burton Elementary School serves grades K-8 on a 26-acre site which includes newly purchased land. Located in California's fertile Central Valley in an arid and mild climate, the school is situated in semi-rural surroundings. Present school enrollment is in excess of 500. Enrollment projections to meet the area growth over the next several years indicate an ultimate student population of 1,000. The District, presently comprising one elementary school, anticipates accommodating this enrollment by construction of a new middle school on the same site as the elementary school.

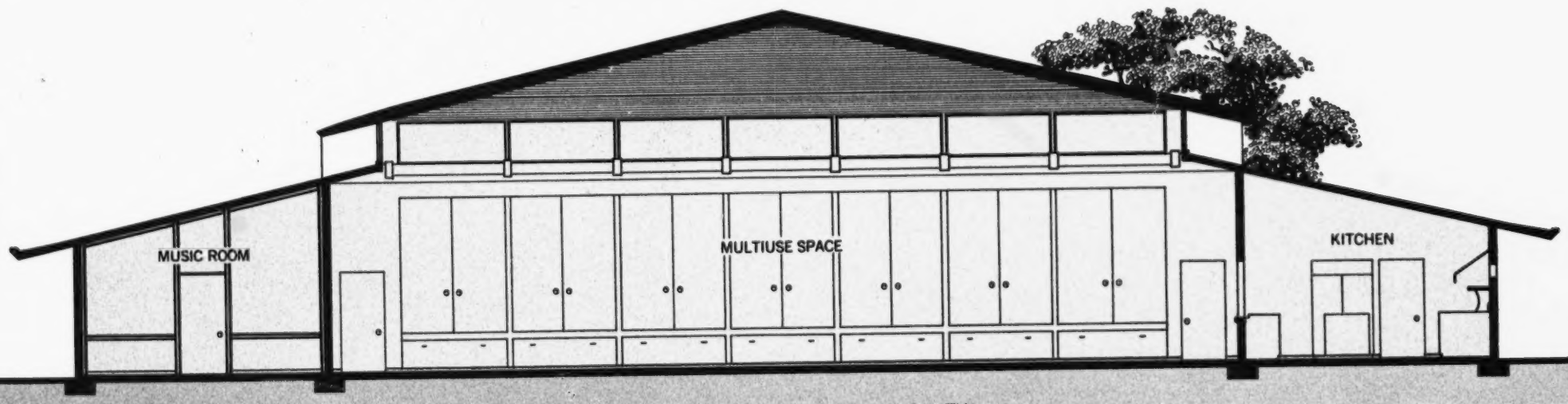
The present Burton School consists of seven wings in a "finger-plan" arrangement. The schoolhouse has grown incrementally in five phases from 1952, the year the first units were constructed, to 1965, the year of the most recent addition. Incremental growth will continue for the new middle school, with teaching space to be added as needed. The plant today provides 17 self-contained classrooms, one kindergarten, a multipurpose room and administrative offices. Present buildings are one-story, slab-on-grade, wood framed, non-bearing walls, with stucco exterior finish, and wood roof deck carried on steel bents and steel columns.

Problems identified with this schoolhouse are not with old, outdated construction, as is the case with many of California's existing schools, but rather with inadequate auxiliary service facilities and inflexibility of teaching spaces. With the school's continuing growth in enrollment, there is need for additional teaching space and for service facilities for library, industrial arts, shop, and homemaking classes.

The design program for the architectural team called for masterplan development of the new middle school with careful consideration for maximum flexibility in teaching. The program called for detailed development of a new multiuse facility to serve for cafeteria, physical education, performing arts education, and music education. This multiuse facility was to have the additional function as the only large meeting space for the entire community.

In his solution, Rosse proposes to modify the existing plant to allow greater flexibility for teaching-learning experiences and proposes to develop new facilities to serve primarily for grades 6-8. The existing structure remains, but many interior partitions are removed to eliminate the rigidity imposed by the self-contained classrooms, and portions of narrow courts separating wings of the "finger-plan" schoolhouse are roofed and thus become extensions of the existing building units. These spaces, which Rosse calls "instructional commons," become the focal points of instructional activity as well as the common areas for library materials plus other services for the teaching spaces.

By this simple alteration, Rosse has created flexible teaching spaces, allowing a variety of activities and varying group sizes, where before there were only self-contained classrooms which limited activities and generally were inefficiently used. By adding two of these "instructional commons," each of 1,932 sq. ft., between wings, Rosse has created space for ungraded teaching for the equivalent of 12 classes, six in each area.



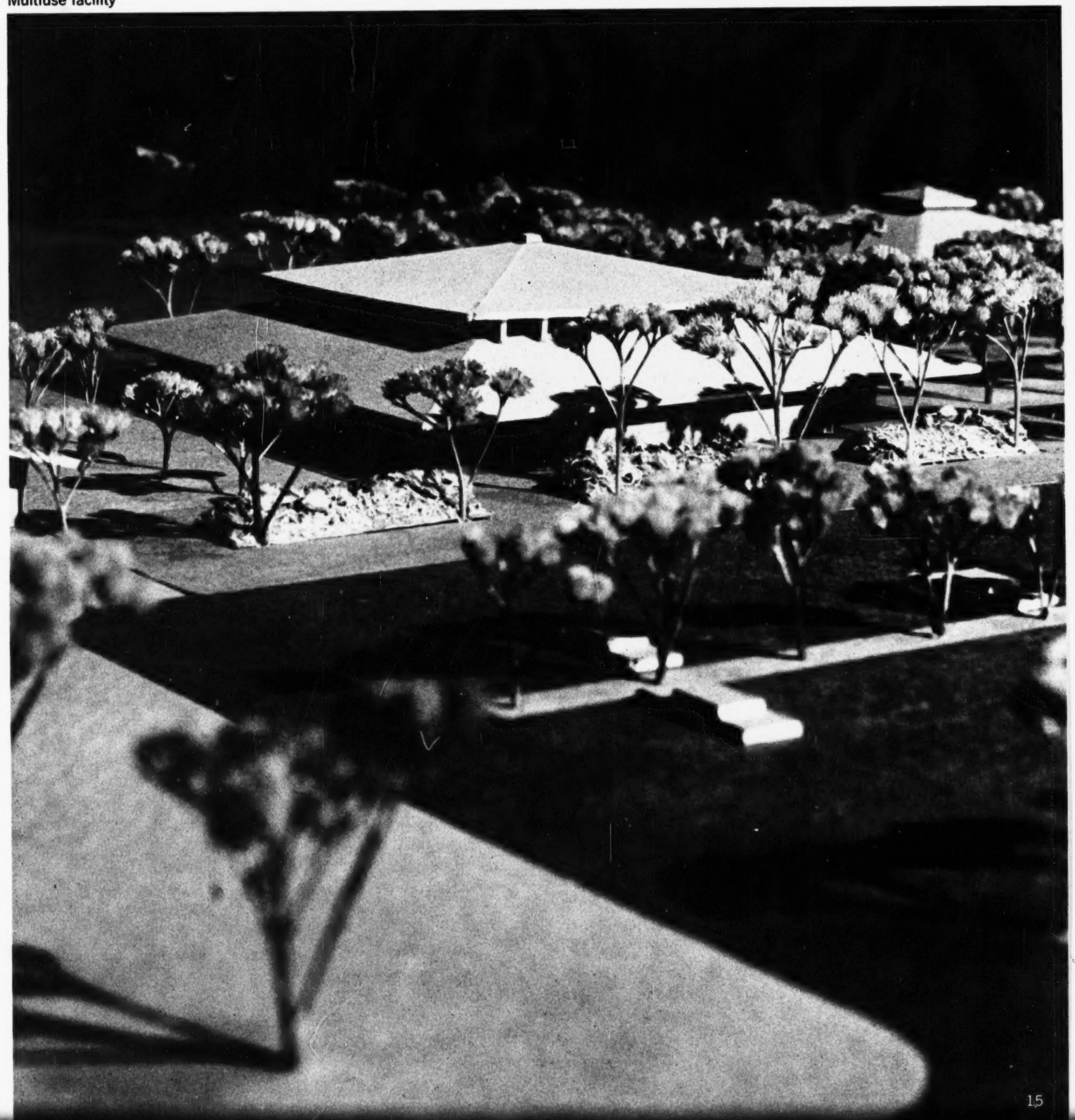
SECTION THROUGH MULTIUSE FACILITY

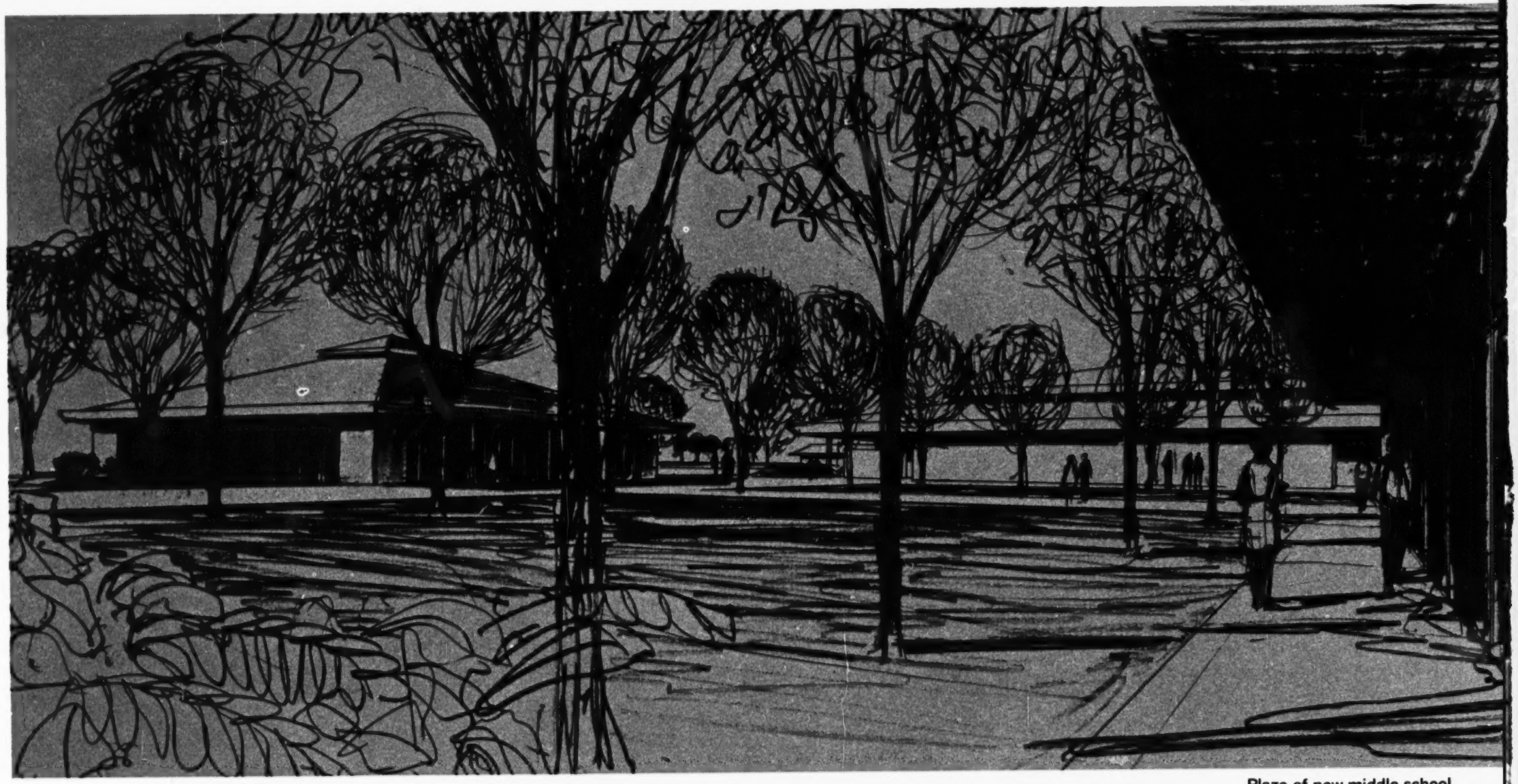
These newly created flexible teaching areas will serve approximately 57% of the 595 pupils projected for grades 1-5 who will remain in the present schoolhouse. The present multipurpose room is converted to teaching area and adds the equivalent of four classrooms to the present 17 for a total of 21 teaching stations for grades 1-5. Rosse's proposal permits a student-teacher load of about 28.3 pupils per teacher.

The new middle school for grades 6-8, serving a projected 355 students, has been positioned to give a strong site relationship between the new and old facilities. Though the new facilities are planned differently from the present "finger-plan" arrangement, an existing center walk has been extended to the new facilities and terminates at a tree-planted plaza to provide continuity between new and old. Rosse also envisioned a scheme which permits incremental construction to meet gradual enrollment increases. Around the plaza he has grouped five separate buildings, each of which can function as an independent unit. This building quintet includes two classroom units, each of flexible space design and each housing six teaching stations, an industrial arts-fine arts-homemaking building, a library-administration building, and a multiuse facility. The library-administration building and the multiuse facility are conveniently positioned between new and existing teaching areas and also front on a common parking area where they can best serve the wider community. In a sense, these two units become the center of the new campus.

The new classroom buildings are designed on a 40-inch module. The roof structure spans the entire interior space without columns, with a flat ceiling at a height of 10'-8". The 40-inch ceiling grid will allow setting of nonbearing partitions at any point in the space. The space is designed for open use without partitions, and all furniture and space dividers throughout are movable. Carpet on the floor and acoustic ceilings will control sound between teaching areas. Mechanical equipment for ventilation is set in the attic space between trusses; ducts distribute air to wherever it is needed in the buildings.

Multiuse facility





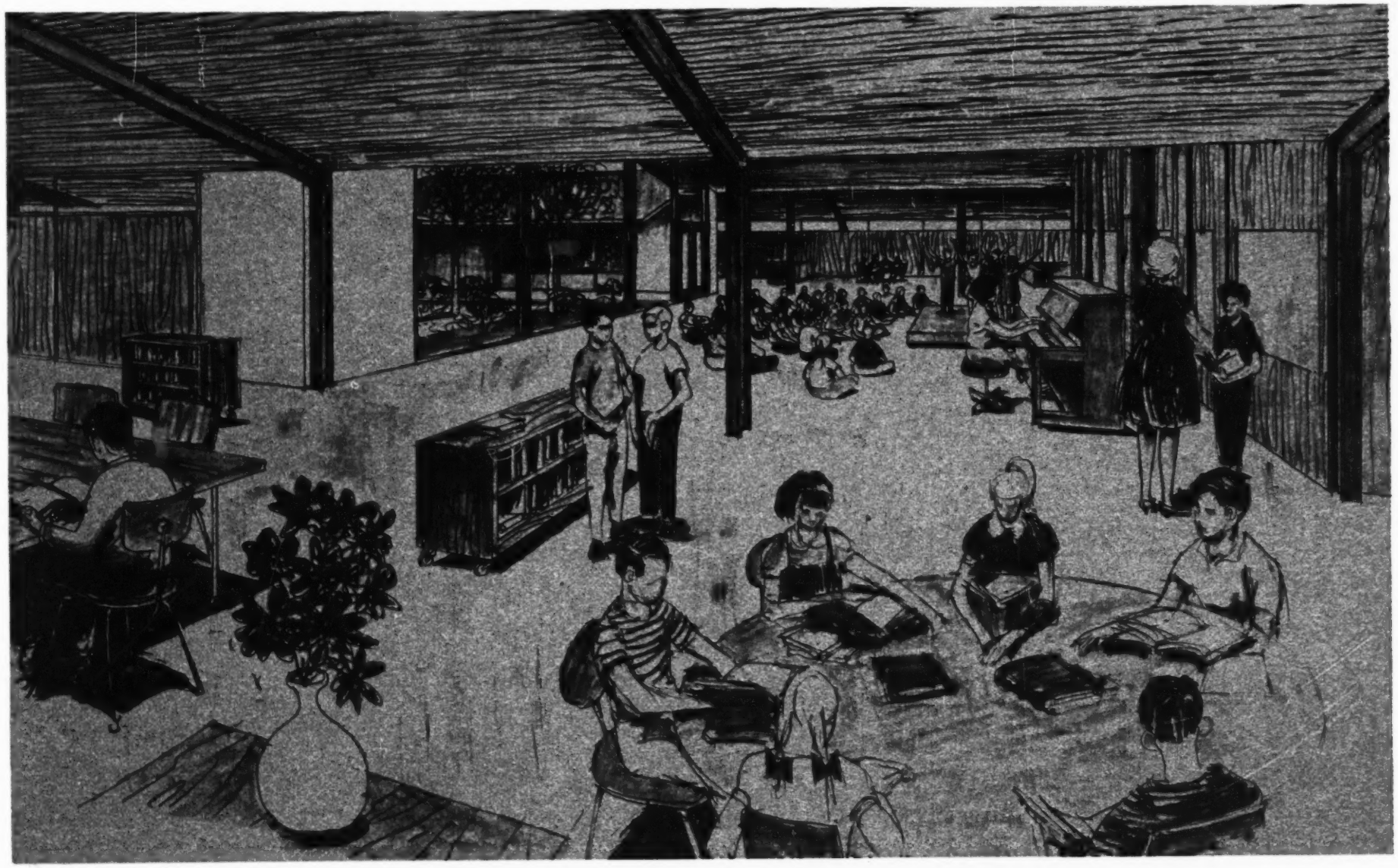
Plaza of new middle school

AREA SUMMARY

Existing Schoolhouse	**29,549 sq. ft. total**
Proposed Schoolhouse	**65,749 sq. ft. total**
Existing Buildings	29,549 sq. ft.
New Instructional Commons	3,864 sq. ft.
New Classroom Building 1	6,484 sq. ft.
New Classroom Building 2	6,624 sq. ft.
Industrial Arts-Fine Arts-Homemaking Building	6,400 sq. ft.
Library-Administration Building	4,096 sq. ft.
Multiuse Facility	8,732 sq. ft.
New Construction	**36,200 sq. ft. total**

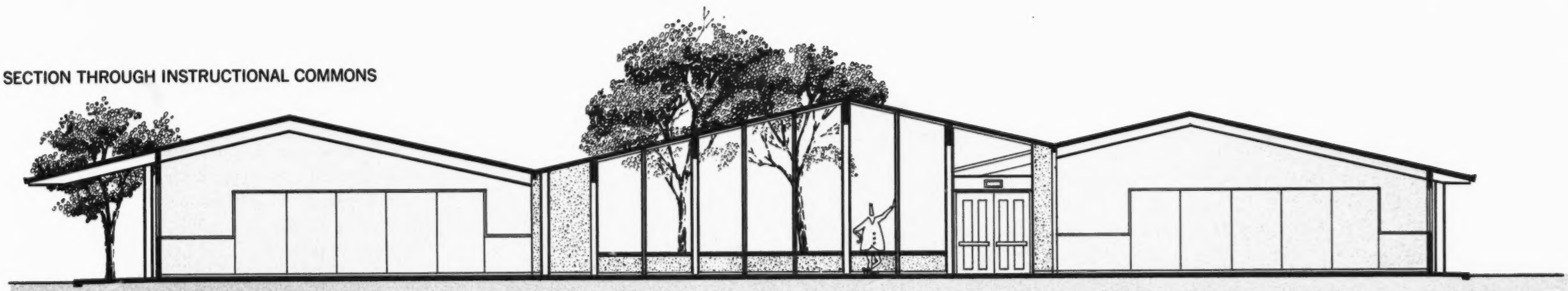
ESTIMATED CONSTRUCTION COSTS

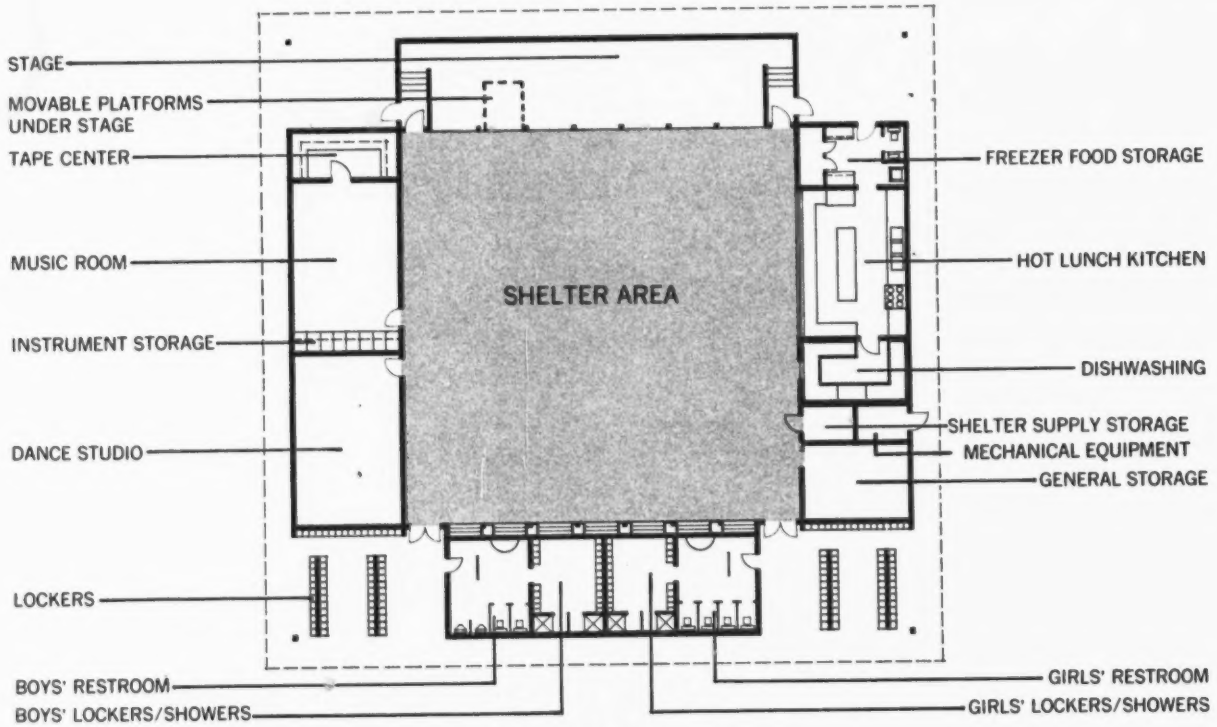
Remodeling of Existing Buildings	$ 1,929.00	
New Instructional Commons	37,405.00	$ 9.68/sq. ft.
New Classroom Building 1	70,779.00	10.91/sq. ft.
New Classroom Building 2	79,189.00	11.95/sq. ft.
Industrial Arts-Fine Arts Homemaking Building	62,492.00	9.76/sq. ft.
Library-Administration Building	56,784.00	13.86/sq. ft.
Multiuse Facility	127,153.00	14.56/sq. ft.
Additional Cost for Fallout Protection in Multiuse Facility	10,105.00	
Additional Cost For Fallout Protection in Redesigned Industrial Arts-Fine Arts-Homemaking Building	12,222.00	
Total Estimated Construction Costs	**$158,058.00**	



Interior of instructional commons

SECTION THROUGH INSTRUCTIONAL COMMONS





MULTIUSE FACILITY

INDUSTRIAL ARTS/FINE ARTS/HOMEMAKING BUILDING
REDESIGNED WITH FALLOUT PROTECTION

HOW FALLOUT PROTECTION WAS ACHIEVED

Fallout protection

Fallout protection was a design consideration for the new multiuse facility. The problems faced by all designers in providing fallout protection for aboveground, one-story, light-framed buildings are epitomized in the Burton Elementary School. Such buildings offer little inherent protection. To arrive at economically acceptable shielding solutions for these buildings requires skillful design in order to minimize increases in construction mass. Rosse met these problems with a straight-forward approach in his proposal for shelter for the multiuse facility and did so without any deliberate warping of educational functions or building form. This direct approach to providing fallout protection may well explain the economical solution which he achieved, a cost increase estimated at just $10,105 above construction of the building without fallout protection.

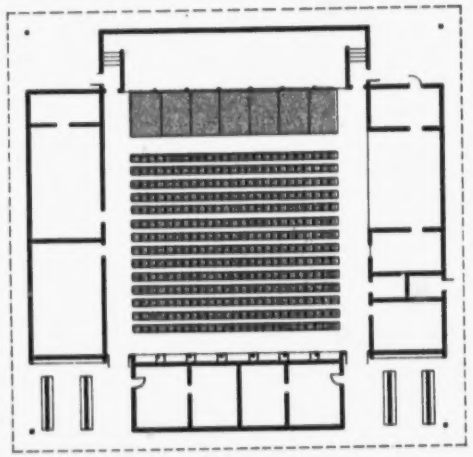
The problem of providing fallout protection was complicated, of course, by the numerous functions to be accommodated in the multiuse facility, including the cafeteria, physical education, performing arts, a group assembly area for school and community use, a music room, etc. All these activities led the design team to create a large core area, free from obstructions and surrounded by the variety of service spaces needed for the several functions. This plan arrangement becomes readily adaptable to radiation shielding. Ground source radiation is reduced by two barrier walls in the scheme proposed by Rosse. When the walls are made massive enough, this radiation source can be reduced to a tolerable level. Wall construction of concrete block was selected as appropriate for structural reasons and also for shielding. Cores of the block are filled with slush concrete and reinforcing steel, not only to give added mass for radiation shielding but also to meet the earthquake resistance requirements of the California construction code. As Rosse points out, the reinforcing of filled block cores is a common construction practice used to satisfy the earthquake resistance problem.

Shielding from roof-source radiation in any one-story building always is a problem. Though light wood framing would normally have been

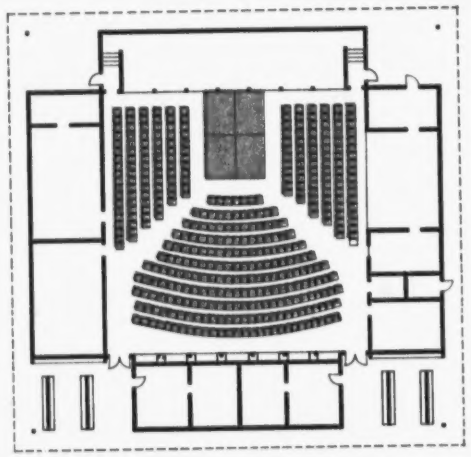
used for all roof construction for the Burton School, Rosse again met the radiation shielding problem directly for the multiuse facility by proposing a nine-inch concrete plate slab, sloped from the four sides to the roof peak in the same manner as the wood-framed roofs of the other new buildings. He chose a plate slab in lieu of more complicated concrete framing systems for economy. Though more costly than wood framing, this solution provides protection not possible with wood, and the economy achieved verifies Rosse's judgment. Walls and interior partitions of concrete block provide the structural support for the concrete roof planes in addition to their shielding function.

The protected area of the multiuse facility will accommodate 390 persons. A protection factor of just over 40 is provided. The architect suggests that shelter space for the entire Burton School enrollment could be achieved by applying the principles he proposes to two other buildings of the five which will make up the new middle school. It was not possible to do this in a single building, since the incremental construction phasing precludes erection of large buildings with area adequate for a shelter occupancy of 1,000 persons. Demonstrating the application of the fallout protection principles proposed by Rosse, the industrial arts-fine arts-homemaking building was replanned to provide acceptable fallout shelter for an additional 325 persons. By moving needed service spaces to the building perimeter, a core area similar to the multiuse facility has been created.

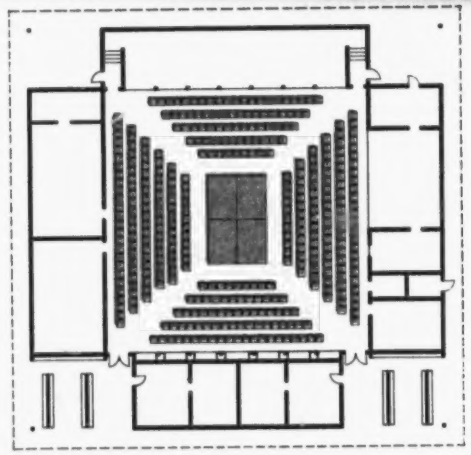
The multiuse facility offers several significant features which contribute to its habitability and comfort as a shelter area. Finishes of floors, ceilings, and walls are of good quality, and lighting quality is excellent, since the space is intended for daily educational use. The serving kitchen for the cafeteria opens directly to the shelter area, thus permitting its use during any period when the space might be used as a shelter. Also, Rosse provides natural light into the core area by an innovative design of a clerestory at the separation point of the building's high roof and lower peripheral roof. An overhanging roof at the higher plane provides the necessary shielding as well as sun and glare control.



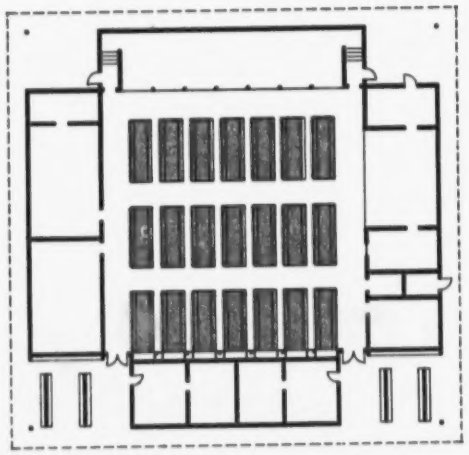
WIDE PLATFORM STAGE (SEATING FOR 350)



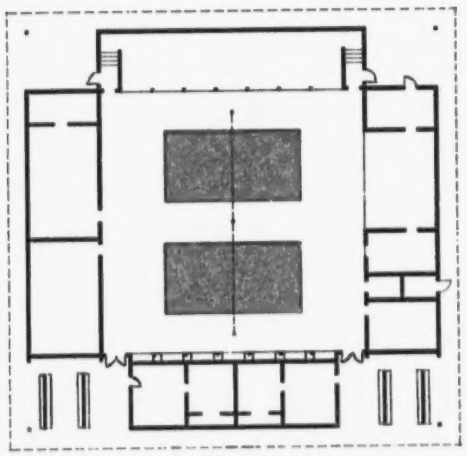
THRUST STAGE (SEATING FOR 334)



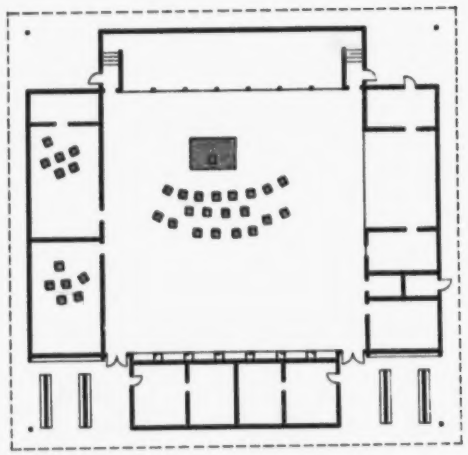
THEATER-IN-THE-ROUND (SEATING FOR 392)



CAFETERIA (SEATING FOR 378)



DANCE AND PHYSICAL EDUCATION



MUSIC PROGRAMS

FLEXIBILITY OF THE MULTIUSE FACILITY.

About the architect

PAUL BAILLY, AIA, is a partner in the firm of Angelikis and Bailly, Beverly Hills, California. He divides his time between practice and the University of Southern California, where he serves as a design critic on the teaching faculty of the Department of Architecture. A graduate of the University of Minnesota, Bailly also acquired a Master's degree in Architecture at the Massachusetts Institute of Technology. He has practiced in the Los Angeles area since 1962. Thorough and meticulous, Bailly always is in full control of his work. These traits are reflected in the intricate and carefully studied proposals for upgrading Sacramento High School.

Project Educational Consultant:
John D. Meyer
Director of Construction Services
Sacramento City Unified School District

Student Design Team:
Jesse Adame
Kent Fairbanks
Lloyd Knowles
Keith Sorenson
David Stauffer

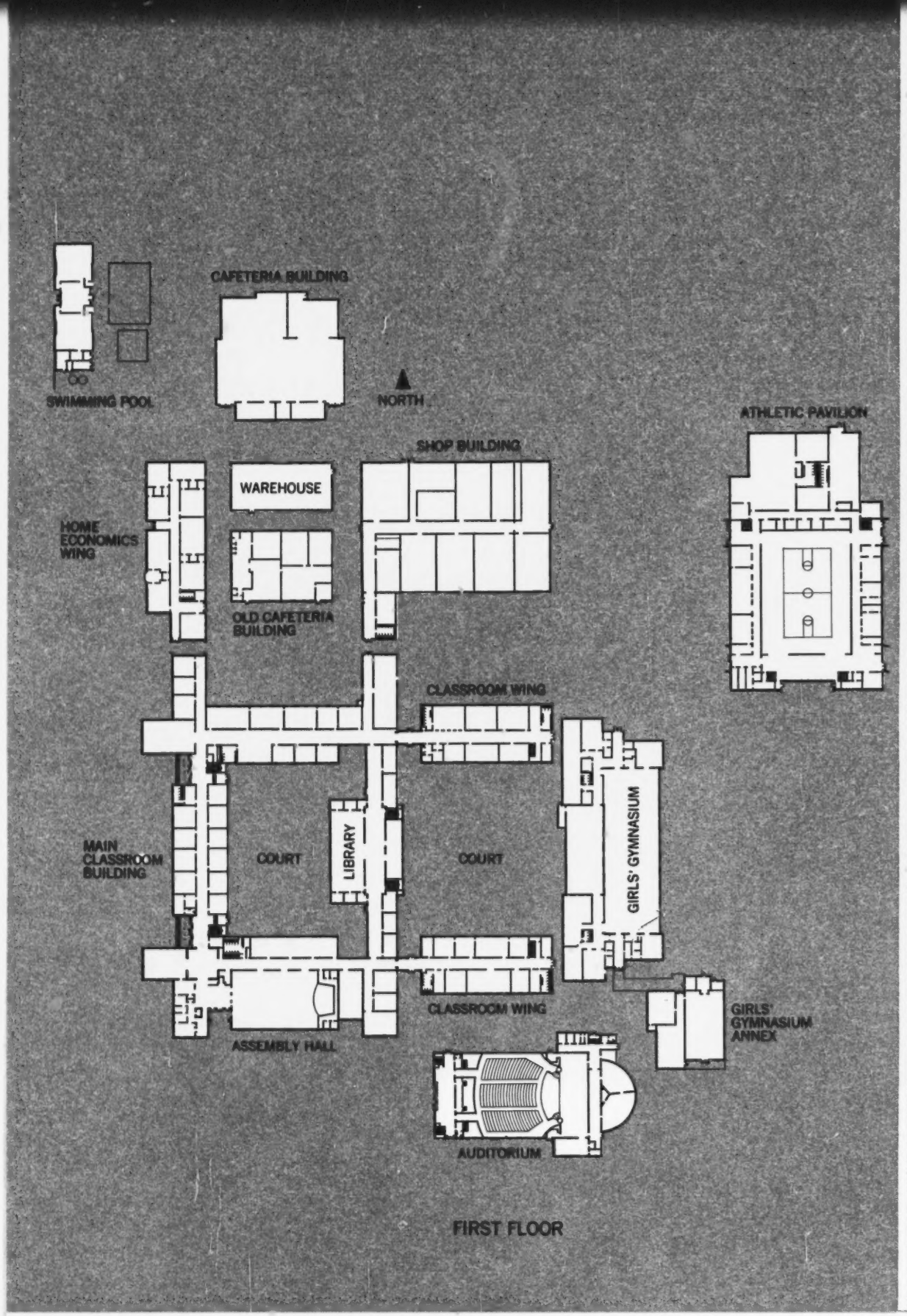
SACRAMENTO HIGH SCHOOL

Sacramento City Unified School District Sacramento, California

View from South

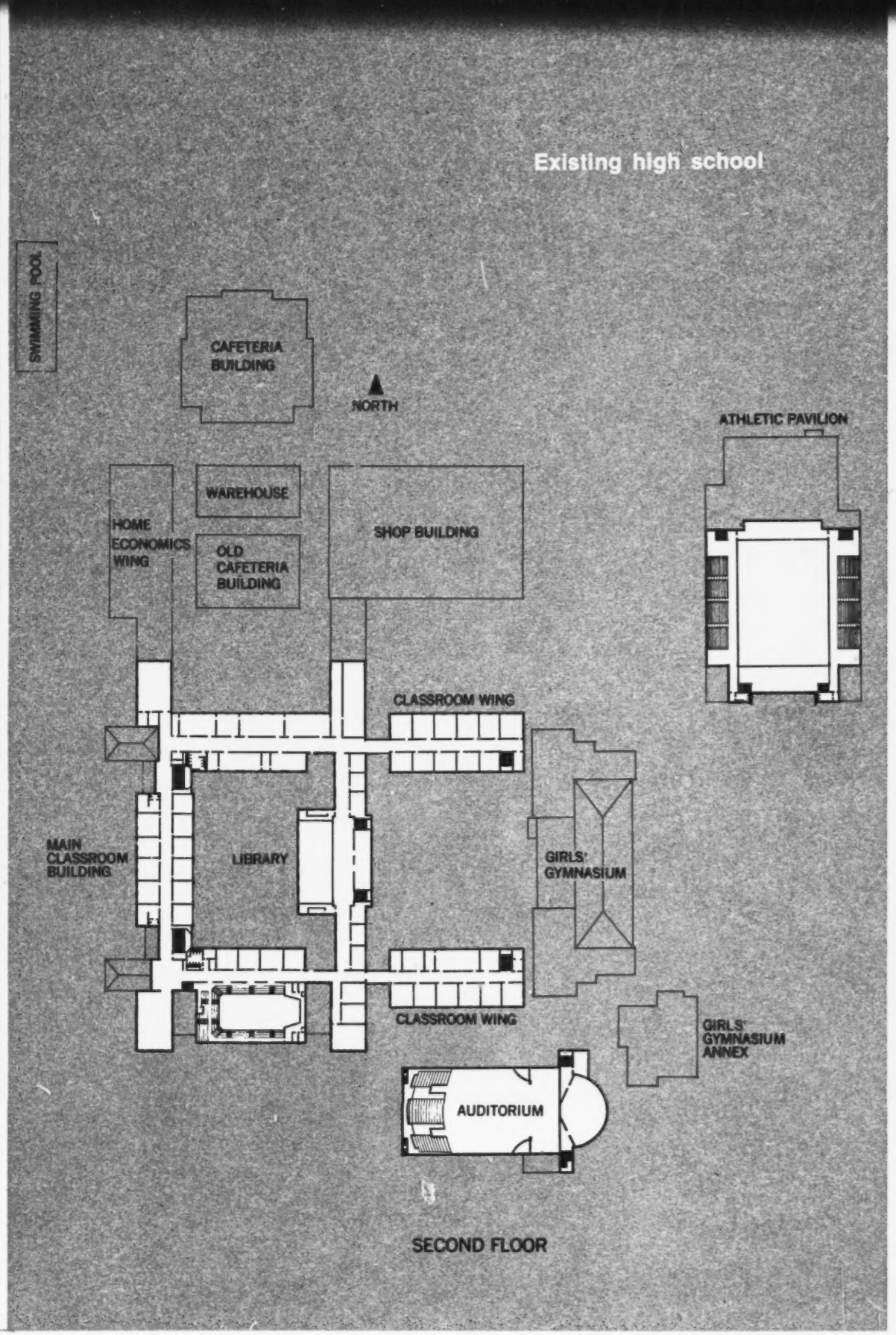
SACRAMENTO

SWIMMING POOL
SCIENCES-INDUSTRIAL ARTS
& FINE ARTS BUILDING
ATHLETIC PAVILION
SCIENCES &
TECHNOLOGY CENTE
MAIN CL
BU
ACADE
MEDIA CE
PERFORMING
ARTS CENTER
AUDITORIUM



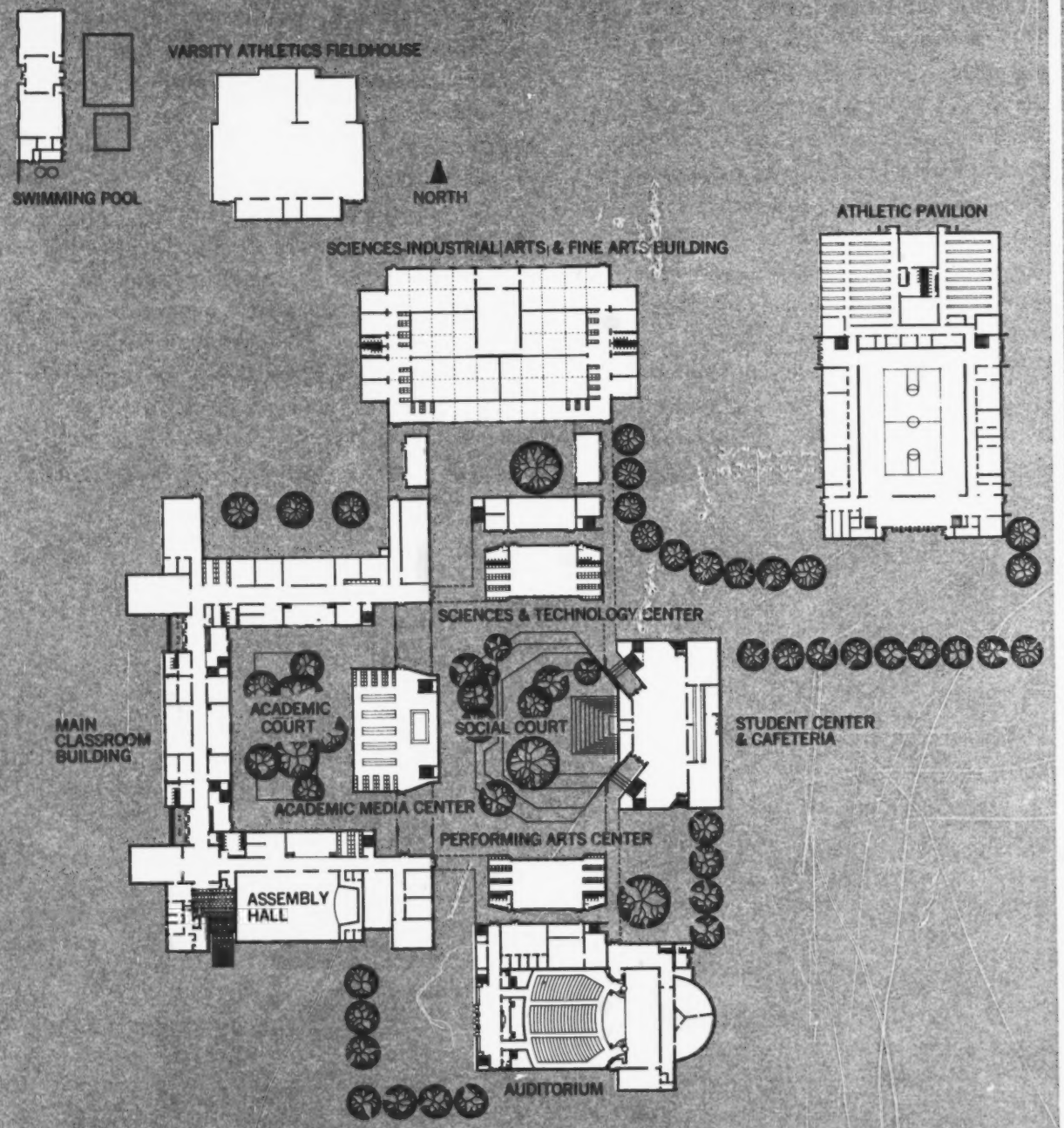
FIRST FLOOR

Existing high school

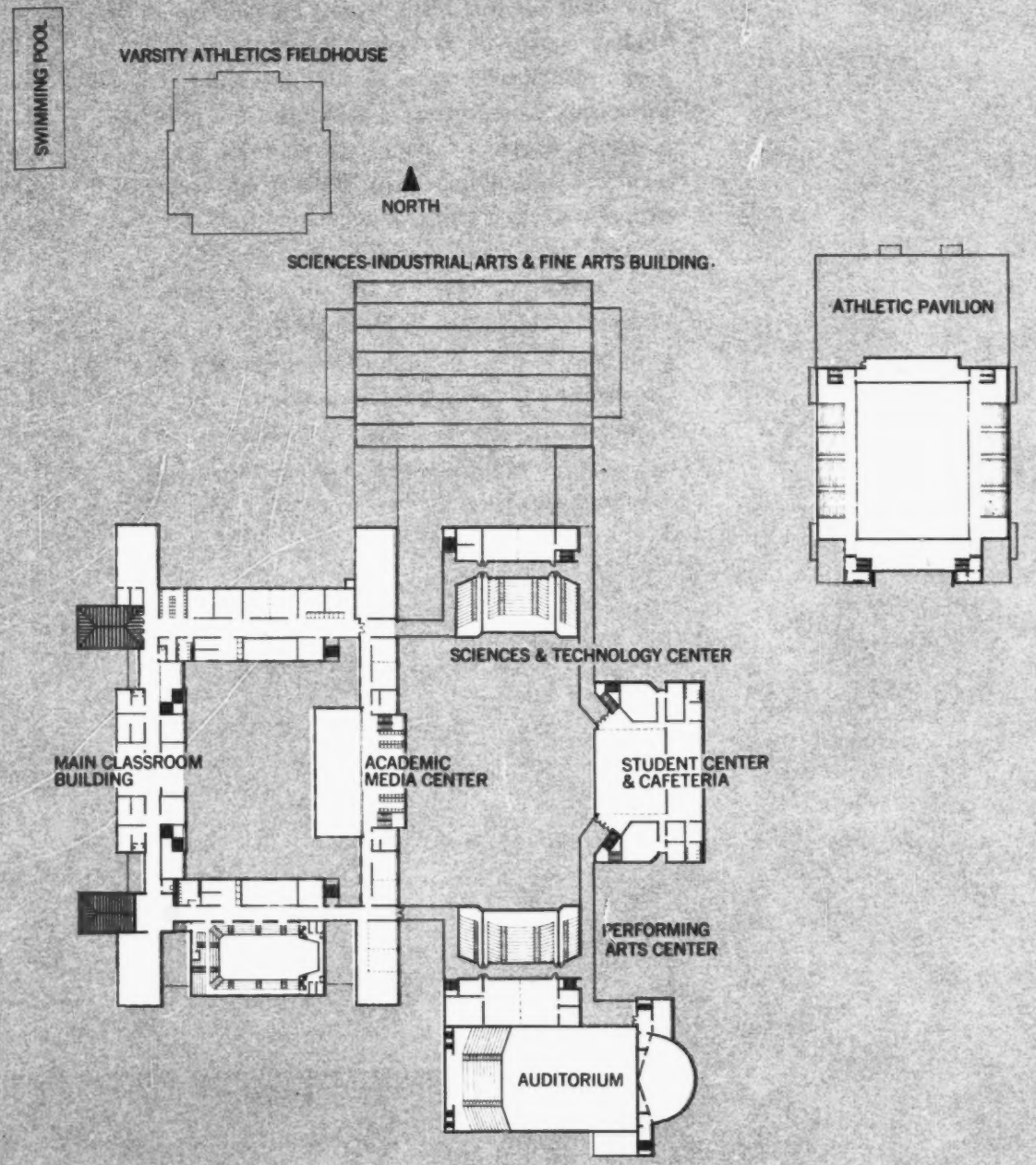


SECOND FLOOR

Proposed high school



FIRST FLOOR



SECOND FLOOR

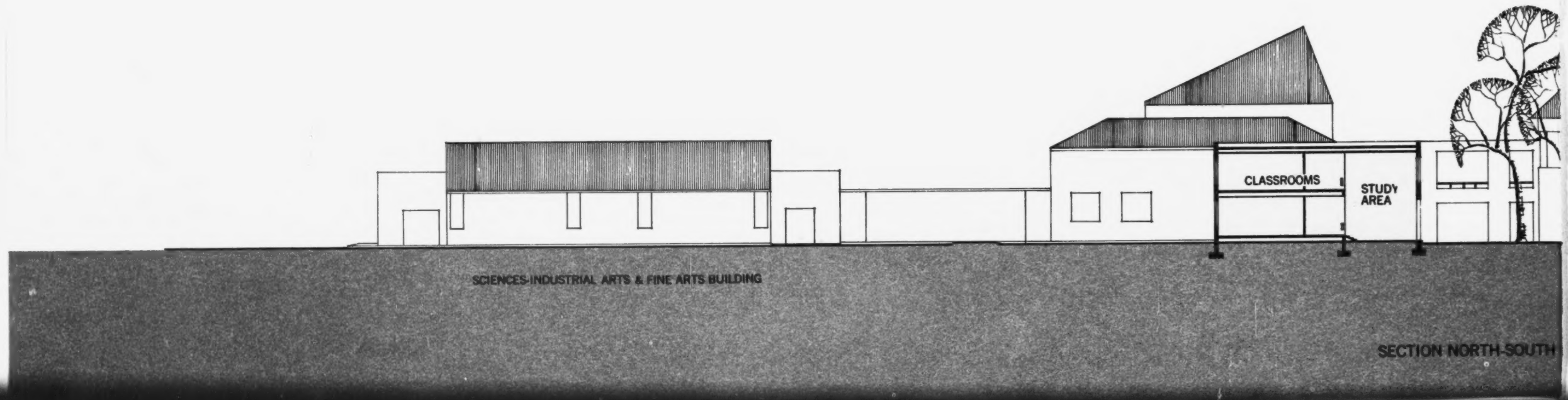
About the project

Comprehensive high schools probably are at the forefront of building types whose programs and space needs have shifted over the years, necessitating constant modifications and additions. Few high schools can be found today that have not been altered and expanded from their original plant layout. Sacramento High School is no exception. The present plant evidences a proliferation of additions and extensions. Comprising 14 buildings, the present school is akin to a campus-type plan arrangement. These buildings were constructed over a number of years commencing with the original high school in 1923. A swimming pool facility was added to the site as recently as 1967. Additions have included classrooms, gymnasiums, a civic auditorium, shops, science classrooms and cafeterias. Gymnasiums and a cafeteria have been added, have become inadequate and abandoned to other uses in the life span of the facility.

In some instances, additions to these high schools have followed some general masterplan concept. These instances are rare. Usually, schools expand expeditiously to satisfy an immediate space need and often the additions fail to integrate with existing campus buildings and site features, either functionally or aesthetically. After several of the "patch on" additions, most high schools suffer from an absence of functional and aesthetic character. Sacramento High School evidences all of these growing pains. Plan relationships of its numerous buildings are weak and fragmented.

Ten buildings of the campus were completed prior to 1933 and so were not constructed according to seismic resistance standards legislated that year. A recent structural survey of the high school lists six of the fourteen buildings as "high risk" and four as "moderate risk" in terms of their expected resistance to seismic loading. The six "high risk" buildings probably will require early replacement as an economic necessity. Sacramento High School faces major plant modifications if it is to conform with minimum State construction requirements. State legislative action in 1967 has further complicated the problems of this school, the oldest in Sacramento, since a time period has been established for meeting the safety requirements. Structural inadequacies are traceable to unreinforced brick masonry construction and the inadequate tying together of floor, wall and roof systems.

The enormous changes in the campus implied by the necessary structural corrections suggest to the District a need for complete replanning of the educational environment as well as the physical environment. Extensive and costly renovation, demolition and replacement demand that educational revitalization occur simultaneously. While the campus is large and provides most of the services needed



SECTION NORTH-SOUTH

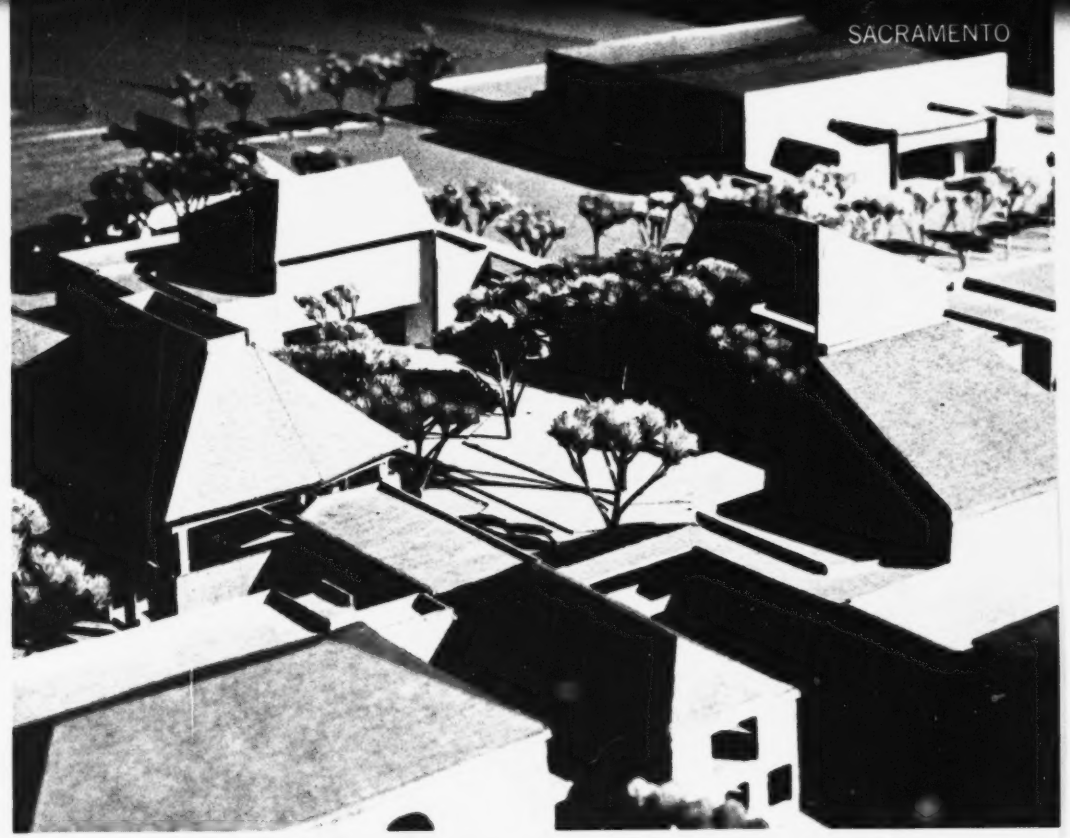
for a comprehensive high school program, generally those services are badly related and are inadequate to meet present educational demands. In several instances, major alterations cannot be economically and educationally justified.

The essential problem faced by the design team was the fabrication of a new and vital educational environment while retaining from the present facilities those elements which are structurally sound and functional and eliminating or replacing those which are not. District programming for Sacramento High School anticipates its continuation as a comprehensive high school to serve grades 10-12. However, its present enrollment of nearly 2,500 will be reduced, preferably to about 1,750 pupils. In its location in an older neighborhood of the central city, the high school has a large ethnic minority enrollment. Still, it serves students pulled from the highest and the lowest socio-economic groups, something that many school districts today are going to great effort to achieve.

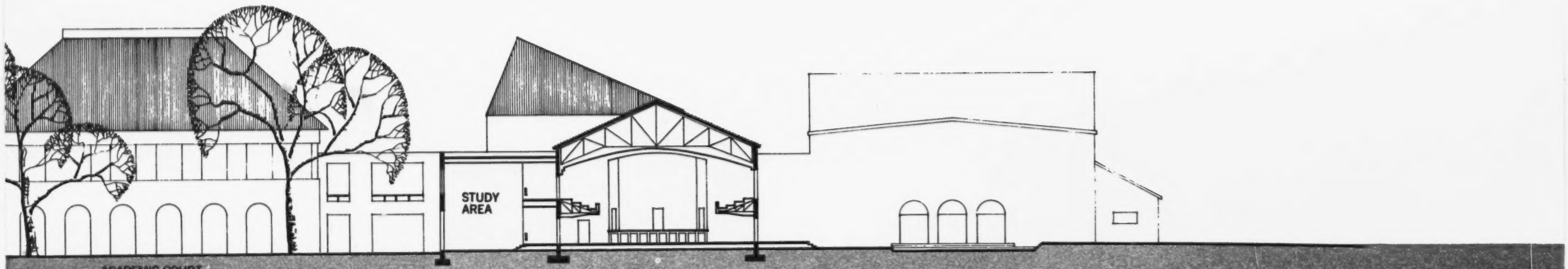
Architect Bailly has described five major considerations which are reflected in his scheme for the new Sacramento High School:

1. Complete reorganization of the campus — a masterplan.
2. Encouragement of student social interaction.
3. Structural and educational upgrading.
4. Development of a new concept for a media center.
5. Provision of fallout protection for the school's enrollment.

In his initial analysis of the present plant, Bailly uncovered some hard facts which would ultimately effect his proposed scheme. The total existing plant area is approximately 345,000 sq. ft. For its 2,500 student enrollment, this represents 139 sq. ft. per pupil, a ratio

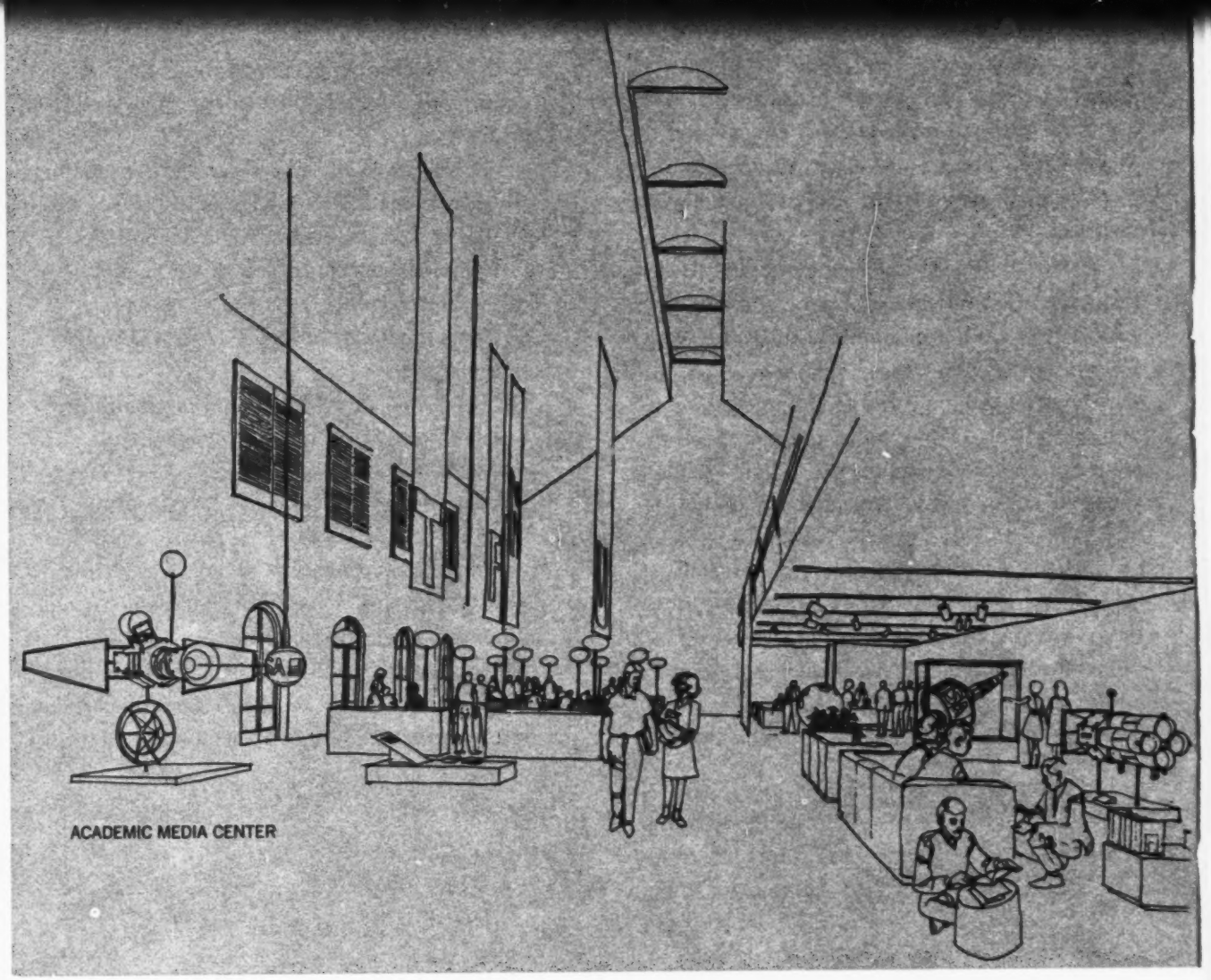


Social court viewed from southwest corner

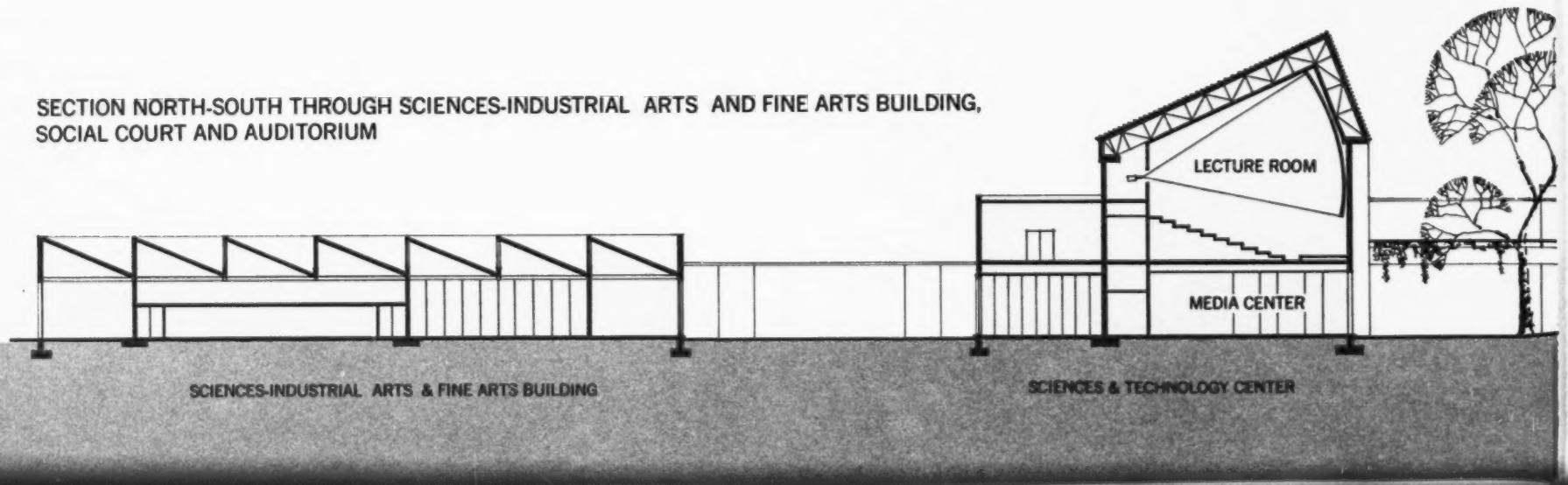


THROUGH MAIN CLASSROOM BUILDING AND ACADEMIC COURT

View from southeast



SECTION NORTH-SOUTH THROUGH SCIENCES-INDUSTRIAL ARTS AND FINE ARTS BUILDING, SOCIAL COURT AND AUDITORIUM

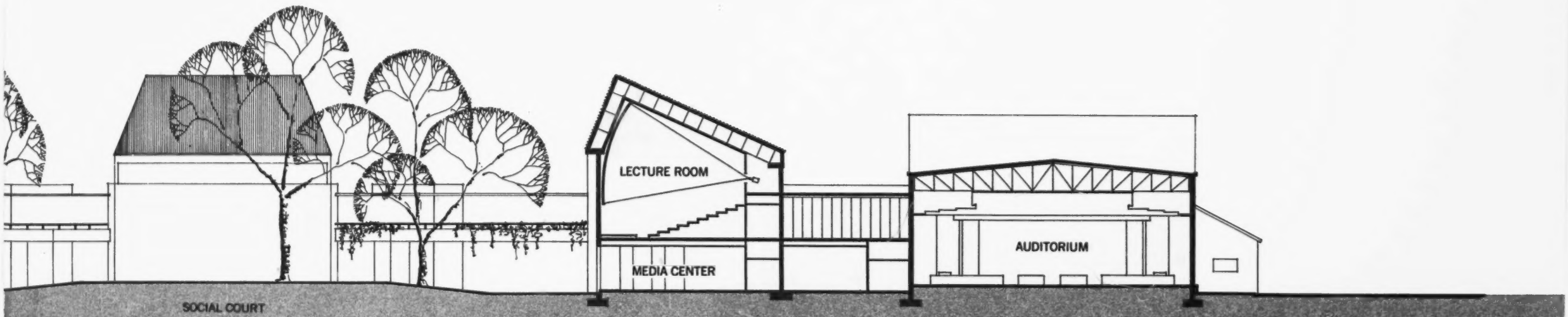


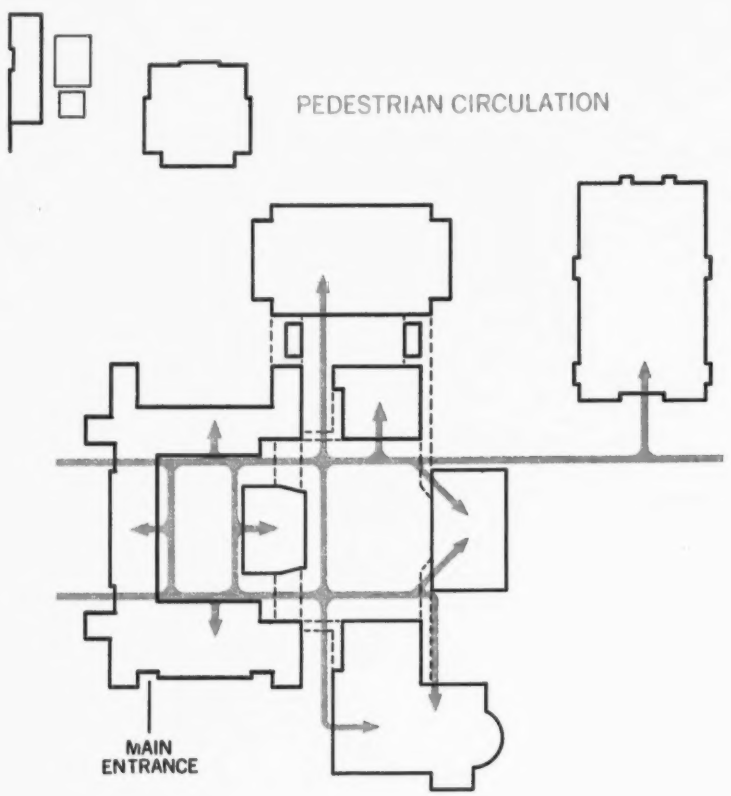
well in excess of the approximately 85 sq. ft. per person used as a basis for planning State-aided schoolhouses. Although Sacramento City Unified School District does not currently participate in the State-aid program, effort normally is made to follow the guidelines. Additional facts on the present plant reveal that almost 155,000 sq. ft. of area is used for the athletic pavilion, girls' gymnasiums, auditorium, cafeteria, swimming pool, and storage warehouse. In other words, almost one-half of the total area of the present plant is used for nonacedamic functions. Yet these are the most recent additions to the campus and for economic reasons must be retained. The design team found it impossible to conform to State-aid area criteria and still provide the needed teaching space for this high school. With a planned enrollment of 1,750, the State-aid area allowance of approximately 85 sq. ft. per pupil gives a maximum total school plant area of 148,750 sq. ft., or just about the combined areas of the several service facilities which must remain.

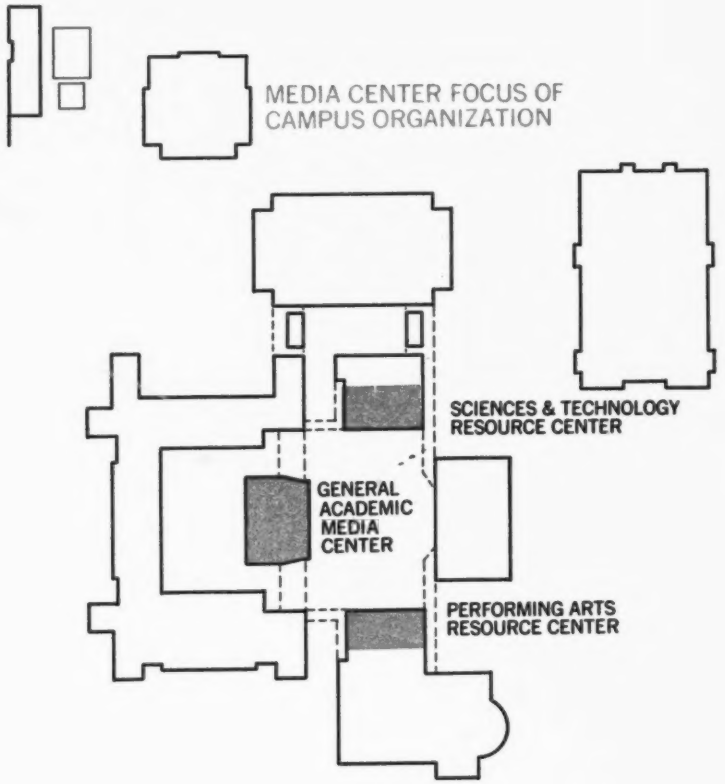
The design team's success in creating a workable and viable educational environment with these limitations of existing conditions is remarkable. Yet, the five design considerations were satisfied in a strong and appealing scheme.

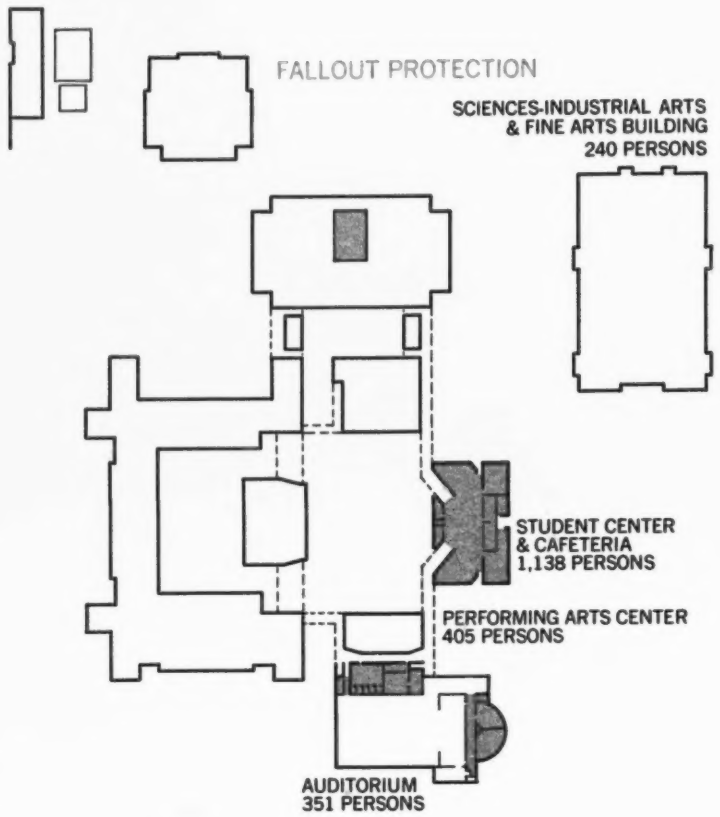
The campus is reogranized around the original 1923 building. Maximum utilization is made of the two existing courtyards to achieve student social interaction, one of the five design considerations. Campus continuity is achieved by a network of open spaces with the two courts as the points of focus. Circulation paths to the several campus buildings lead to and from these courts, and secondary landscaped open spaces identify arrival at peripheral school facilities. The east court, presently little used because of inaccessibility, becomes the social center of the campus. By demolishing several "high risk" and educationally inadequate buildings surrounding the court, the designers have provided new facilities essentially oriented to social interaction. Surrounding the court are a new student center and cafeteria building and three specialized media centers. This court serves as a zoning separation for campus services, with physical education a distance away to the east, academic teaching areas to the west, performing arts center and auditorium to the south, and sciences, art and industrial arts to the north. The west court is oriented to the academic services of the campus and is arranged to serve as a quiet, open-air study space.

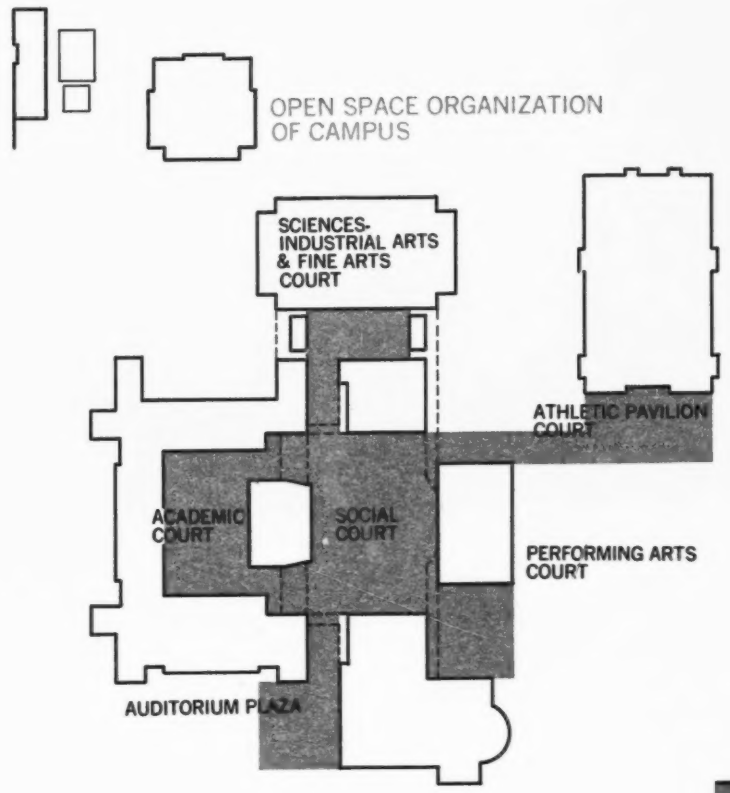
With but one exception, all "high risk" buildings are removed, while new, needed facilities replace them. The demolition represents about 100,00 sq. ft. of which 90% is in "high risk" buildings and 6% is in "moderate risk" construction. The existing shop building has been retained and developed into an extremely appropriate and flexible space for the sciences, fine arts and industrial arts. This is a steel framed structure with excellent open space and skylighting, which was condemned structurally as "high risk" because of an abundance of clay tile partitions. By removing the clay tile partitions and adding a grid of fire-rated sections at the saw-tooth ceiling to permit a one-hour fire separation between shops as required by the State construction code, a completely flexible teaching space has been created out of the old shell. This flexibility of space is highly desirable, since District administrators note that one of their most difficult tasks is predicting enrollments for shop, art and science classes. The flexible space readily permits changing room dimensions and elimination or addition of special teaching areas with minimal effort and without costly mechanical and plumbing system changes.







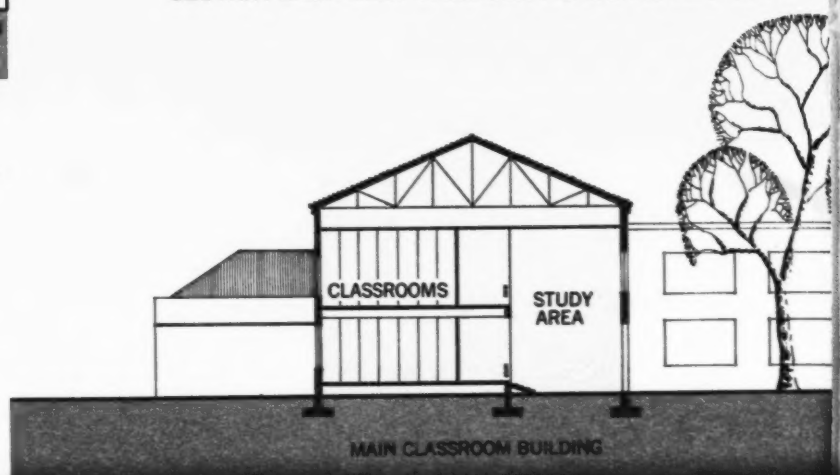




Unique features of the scheme are the architect's suggestions for individual study and student access to the study media. The original classroom building, comprising four wings around the west court, has been designated for academics. Some interior partitions are removed from the three classroom wings to free the teaching space, and these teaching areas orient to central study centers, one in each wing. These study centers are opened to both floor levels of the two-story wings by cutting out a part of the existing floors. Also, the floors of the study centers have been dropped to provide direct access to the study court.

Recognizing the need for dispersal of certain specialized campus services and also logical separation of specialized study materials, the architect suggests three primary media centers. All open onto the social court but are suitably separated to give a privacy needed for study. A general academic library is positioned between the two courts and opens to both. Central to the instructional stations, this media center becomes the core of the new campus. Two specialized media centers are positioned in wings to the north and south; these serve to define the social court. The media center on the north is a specialized facility serving primarily the sciences programs

SECTION EAST-WEST THROUGH ACADEMIC AND SOCIAL



which are located in the remodeled shop building beyond; the south media center serves the performing arts programs and basically is an extension of the auditorium.

Gymnasium facilities, presently separate for boys and girls, have been combined into one building. With minor locker room additions to the large athletic pavilion and a few interior alterations, the fragmented physical education program has been integrated into a single, workable facility. The most recent campus addition in 1967, the community-school swimming pool, remains, although its location in the overall campus plan is strongly questioned by the architect. Varsity athletics, displaced in the present athletic pavilion, are reassigned to the abandoned cafeteria, a large, open shell of a building that can be adapted to a variety of athletic needs and that is well sited for athletic playing fields.

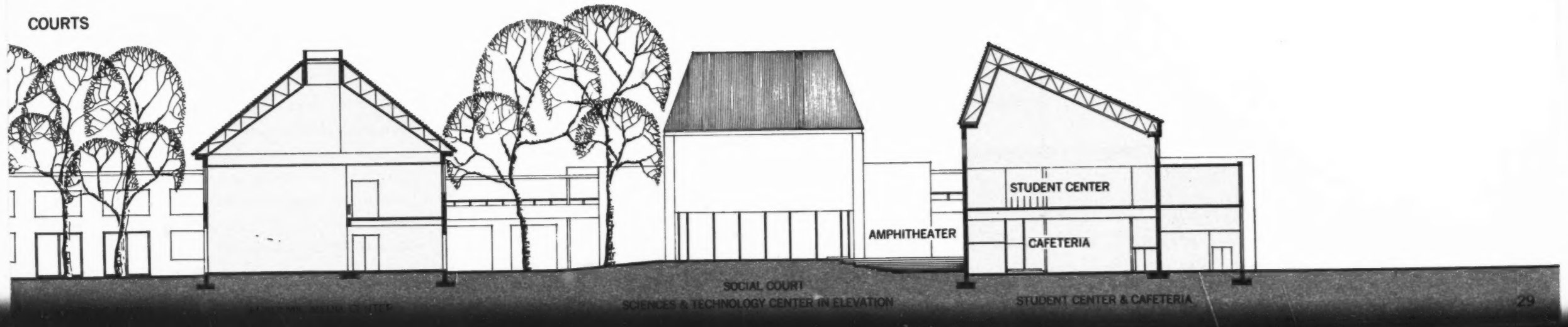
On-site parking for 350 automobiles has been provided in the new school to correct a present and undesirable pattern of street parking by faculty and students. Three major parking areas have been designated in functionally appropriate areas of the campus. In addition, a visitor's parking area is located adjacent to the main entrance to administrative offices.

AREA SUMMARY

Existing High School	**344,547 sq. ft. total**
1923 Classroom Building	114,236 sq. ft.
Classroom Wings	35,200 sq. ft.
Home Economics Wing	11,247 sq. ft.
Girls' Gymnasium	27,647 sq. ft.
Girls' Gymnasium Annex	6,615 sq. ft.
Athletic Pavilion	56,538 sq. ft.
Shop Building	29,436 sq. ft.
Auditorium	28,711 sq. ft.
Cafeteria Building	16,962 sq. ft.
Old Cafeteria Building	8,176 sq. ft.
Swimming Pool Building	5,351 sq. ft.
Warehouse	4,428 sq. ft.
Proposed High School	**325,117 sq. ft. total**
1923 Classroom Building	108,697 sq. ft.
Auditorium	38,364 sq. ft.
Sciences & Technology Center	20,300 sq. ft.
Performing Arts Center	12,596 sq. ft.
Student Center & Cafeteria	27,783 sq. ft.
Athletic Pavilion	59,417 sq. ft.
Sciences-Industrial Arts & Fine Arts Building	35,647 sq. ft.
Field House (formerly Cafeteria)	16,962 sq. ft.
Swimming Pool Building	5,351 sq. ft.
Construction Removed	**102,138 sq. ft. total**
New Construction	**81,794 sq. ft. total**

ESTIMATED CONSTRUCTION COSTS

Demolition of Existing Construction	$112,022.00	
Remodeling of 1923 Classroom Building	222,570.00	
Sciences & Technology Center	357,955.00	$17.63/sq. ft.
Performing Arts Center	390,653.00	17.56/sq. ft.
Student Center & Cafeteria	437,383.00	15.74/sq. ft.
Additions to Athletic Pavilion	60,697.00	
Remodeling of Sciences-Industrial Arts & Fine Arts Building	183,866.00	
Additional Cost for Fallout Protection in Student Center & Cafeteria	6,576.00	
Additional Cost for Fallout Protection in Sciences-Industrial Arts & Fine Arts Building	784.00	
(Fallout protection in other buildings is achieved without cost.)		
Total Estimated Construction Costs	**$1,772,506.00**	



SCIENCES & TECHNOLOGY CENTER IN ELEVATION — STUDENT CENTER & CAFETERIA

Fallout protection

Fallout protection for the occupants of Sacramento High School was achieved with relatively little effort by the designers. Only minor modifications from normal construction were necessary, and no significant design concept changes were needed to gain the shelter because of the two-story building scheme and the heavy construction generally used throughout.

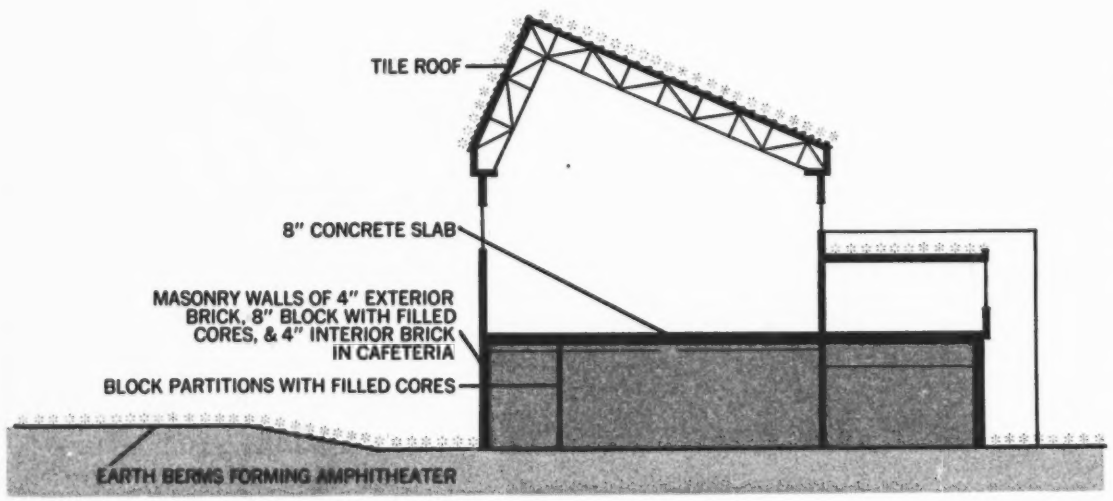
The fallout protected space actually occurs in four separate areas of the school plant. Two of these spaces are inherently shielded, and the other two gain shielding through deliberate design effort. Both of the inherently shielded spaces are in the auditorium-performing arts center. Fallout protection was designed into the cafeteria of the student center building and a core space of the sciences-industrial arts and fine arts building.

Of the two inherently shielded spaces, one already exists on the first floor of the auditorium, an area normally used for music classes. The other inherently shielded space is located in the north addition to the auditorium, a new facility for the theater arts. Both shelter areas are at the lower floor of two-story concrete construction and are enclosed with concrete or brick masonry walls. The inherent shielding results primarily from these two factors. A shelter occupancy of approximately 350 persons is possible in the auditorium; the theater arts addition can house approximately 400 shelter occupants.

A shelter survey of the present high school plant indicates that the main classroom building also provides some radiation protection in interior corridors. However, with the alterations proposed by Bailly, a sizeable portion of this protective space will be lost when interior partitions are removed. Thus, no accounting is made of that shelter space.

The largest shelter area is that which was deliberately designed into the new cafeteria. There a shelter occupancy of more than 1,100 persons can be accommodated. This two-story building for student activities offices and cafeteria was developed to include radiation shielding, since it was deemed by the designers to be the most appropriate of the new campus facilities for that purpose. Not only did the design scheme for this building call for a two-story layout, but also the arrangement and size of the interior spaces seemed to lend themselves to radiation protection. Reinforced concrete construction was planned for floors and roof anyway, so the only design considerations for gaining shelter were the enclosure walls and entrances. Enclosure walls of brick masonry for this building are increased in mass by filling the cores of 8″ block. An interior brick finish for the cafeteria helps considerably in providing the needed wall mass. Effective baffling of entrances for the cafeteria is gained in two ways. First, the openings are recessed at an angle in an innovative design which carries out the form concepts of the general scheme. Second, the social court onto which the cafeteria entrances face is developed with raised land contours to create a small amphitheater. The earth berms designed for the ampitheater seating are used as entranceway baffles for the shelter. These raised earth forms generally benefit the cafeteria shielding by reducing the amount of exposed outside wall along the west side. Although the architect admittedly prefers a glass wall for the cafeteria space, he has achieved in the broad entrances an openness to the court which removes the spatial character from a sense of confinement.

By taking advantage of every opportunity to gain fallout protection at minimum cost and with no educational interference, Bailly also created a shelter space in the core of the large sciences-industrial arts and fine arts building. In need of storage for shop materials, he developed a two-level interior core within this high-ceiling space. Storage occurs on the upper level, accessible but out of the way. The core is assigned to use as a service room and is central to all teaching areas. Shelter was created by use of 8″ block partition walls

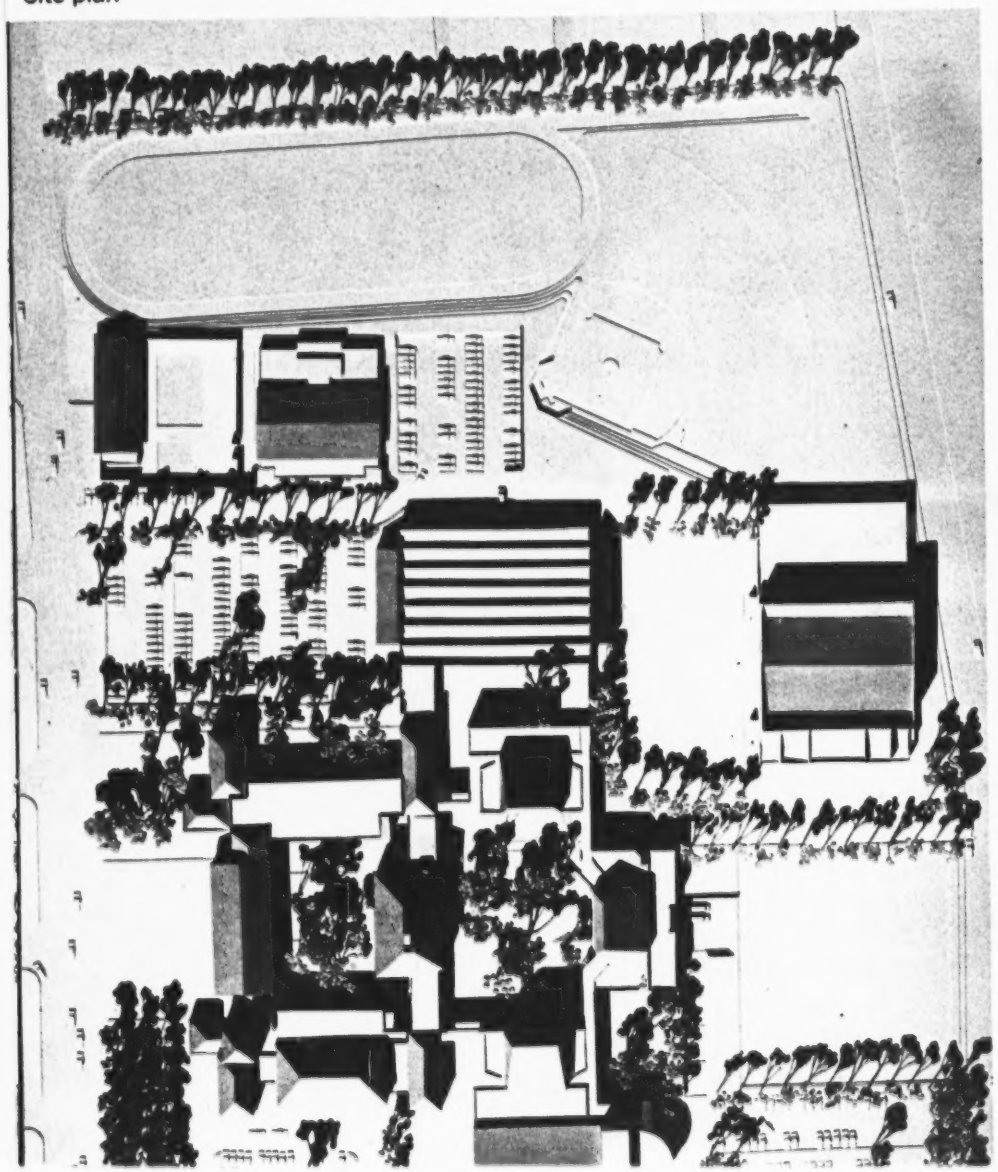


HOW FALLOUT PROTECTION WAS ACHIEVED IN THE STUDENT CENTER AND CAFETERIA

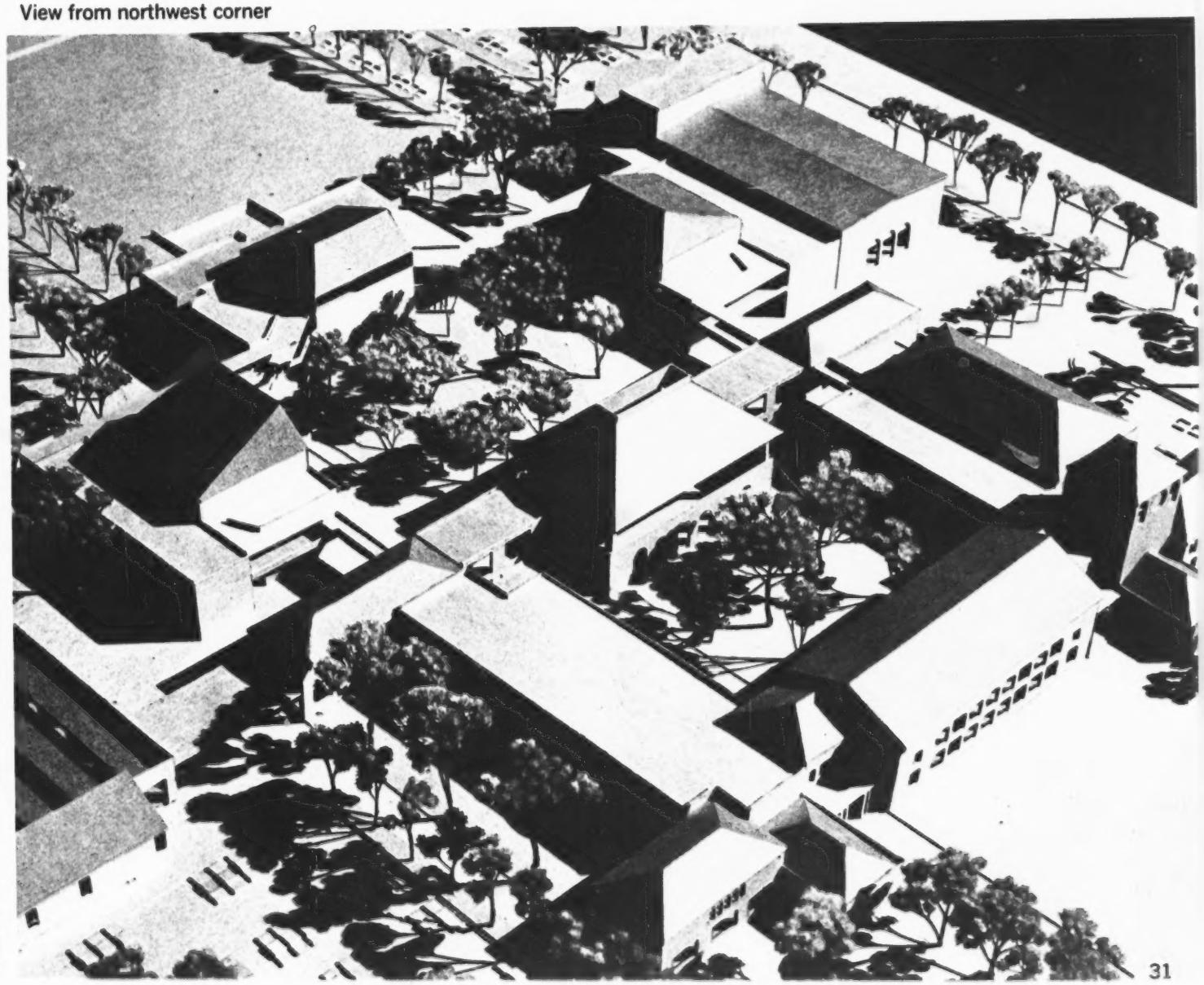
around the core area and a concrete slab for the storage area above. A shelter occupancy of 240 persons is possible in this space.

This school is an example of frequent situations where the opportunities are many for gaining fallout protection with few changes in construction or design concept. In general, these situations are most typical where the buildings are large and of heavy construction. Sacramento High School satisfies these two conditions, and a large amount of fallout shelter space was easily developed at little cost.

Site plan



View from northwest corner



About the architects

This design project was a collaborative effort by two members of the same architectural firm.

RALPH A. EDWARDS, AIA, is a partner in the firm of Edwards and Daniels and Associates of Salt Lake City, Utah. Along with Daniels, he heads one of the more successful and respected firms in the Intermountain Area. The firm is widely recognized for advanced educational planning but has also been recognized for designs of most other building types. A significant current accomplishment of the firm is the new Art and Architecture Building for the University of Utah, scheduled for completion in 1969.

The firm has received recognition in numerous State, regional and National AIA design awards programs. Of eight schools designed by the firm and chosen for presentation at the American School Administrators Association conventions, three have been honored with special citations. The Salt Lake Public Library, designed by the firm, was recognized as the best in the "Public Library" category in the joint AIA-ALA Honor Awards program of 1966.

Edwards was graduated with a degree in architecture from the University of California at Berkeley. After several years of employment in the Bay Area, he moved to Salt Lake City, and established his partnership with George N. Daniels. The firm continues to grow in staff, size and number of commissions, and quality of work.

RALPH F. EVANS is one of four associates in the Edwards and Daniels firm. He was graduated from the University of Utah's Department of Architecture in 1963. As a student, Evans won the Reynolds Aluminum Award at the University of Utah in 1963. Young, imaginative, and a strong delineator, Evans serves as a significant figure in the accomplishments of this firm.

Project Educational Consultant:
Robert O. Dunn
Construction Program Supervisor
Richmond Unified School District

Student Design Team:
Denis Butler
Kenneth Lambert
John Mason
Robert Walker
Tony Yamada

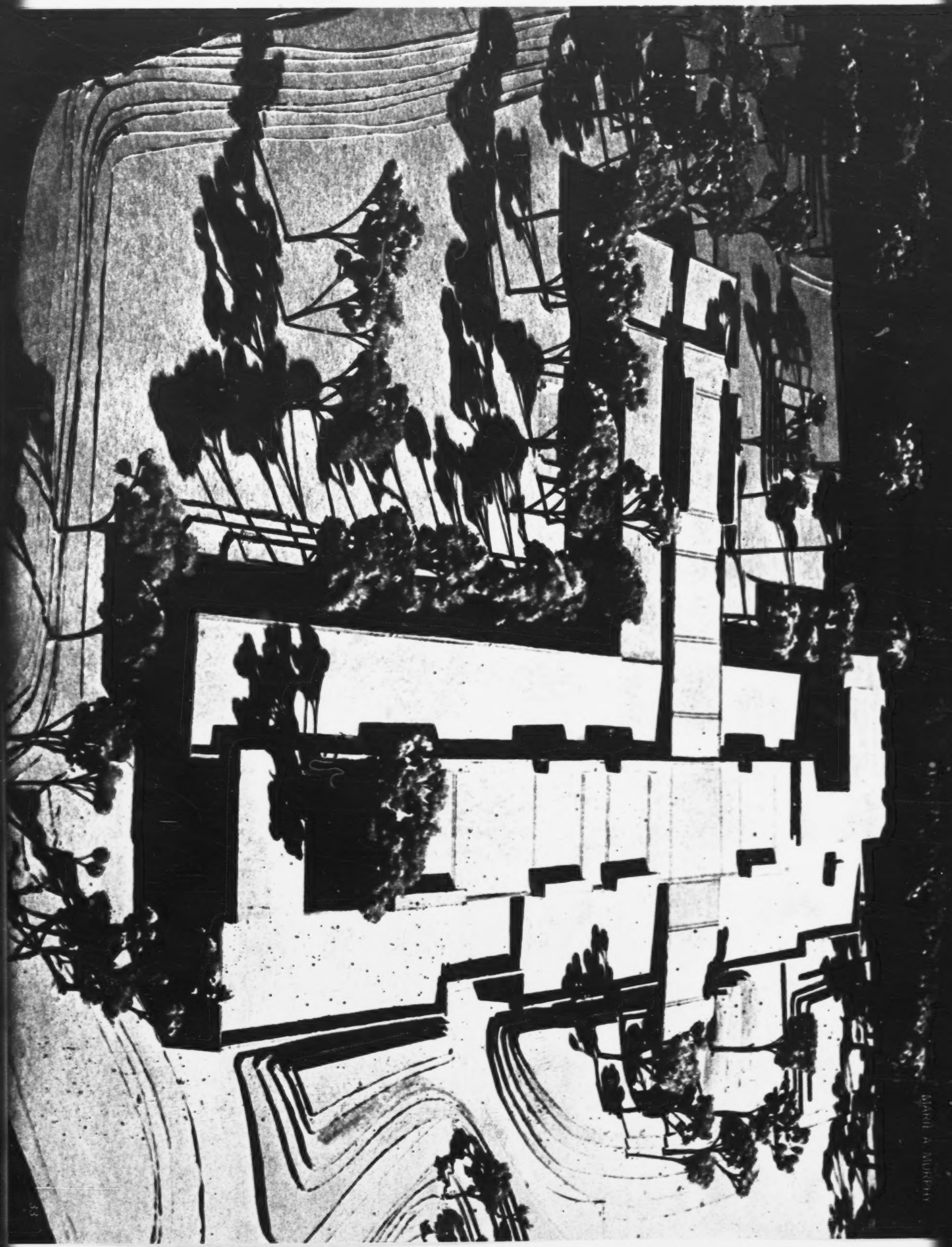
MARIE A. MURPHY ELEMENTARY SCHOOL

Richmond Unified School District El Sobrante, California

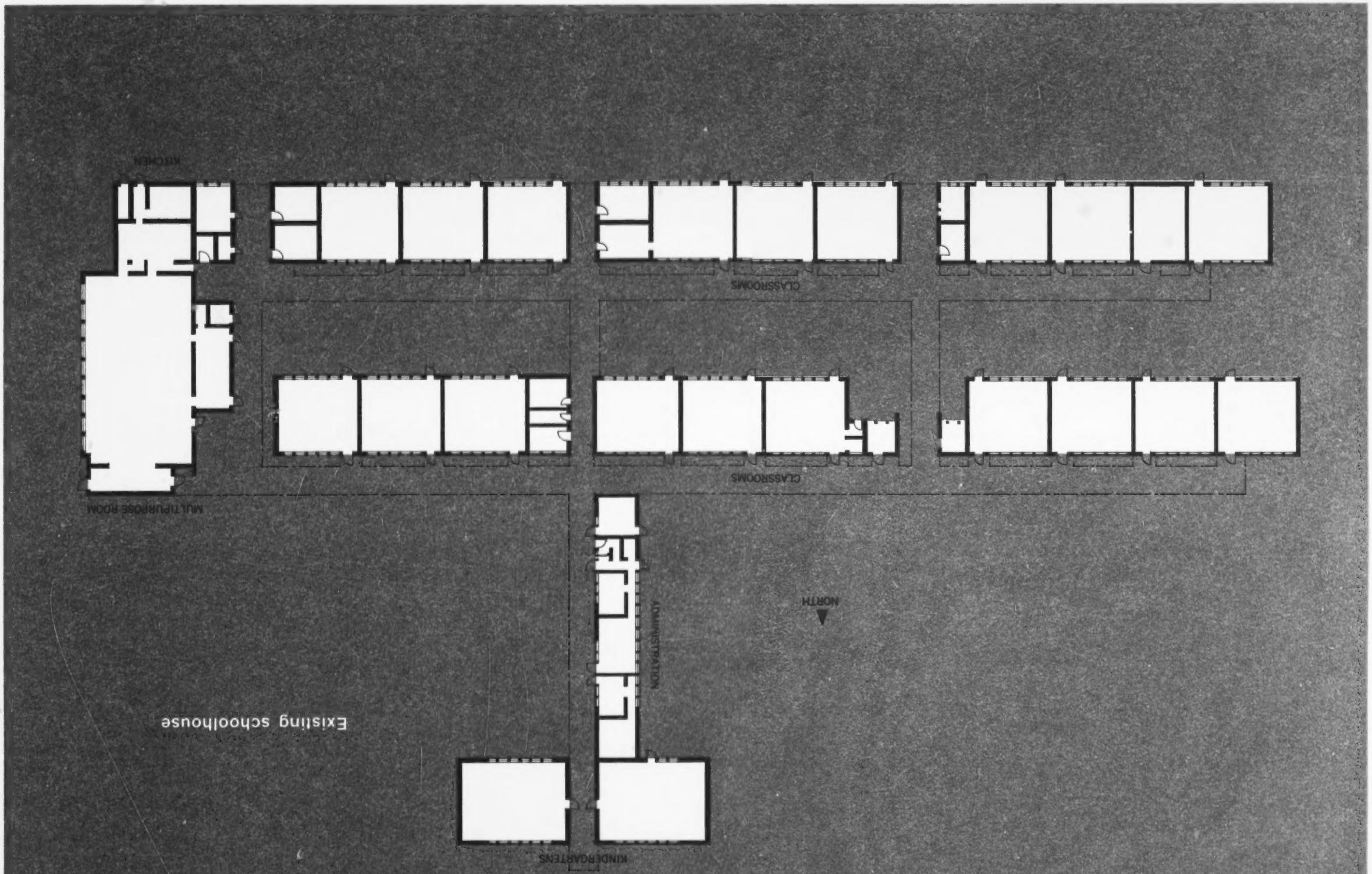
Classroom wings and court between

Multipurpose room and classroom wing viewed from entrance drive

View from west



MANN & MURPHY


KITCHEN
CLASSROOMS
CLASSROOMS
MULTIPURPOSE ROOM
ADMINISTRATION
KINDERGARTENS
NORTH
Existing schoolhouse

Proposed schoolhouse

NORTH

KINDERGARTENS

PRIMARY GRADES

MEDIA CENTER

MULTIPURPOSE FACILITY

FLEXIBLE TEACHING

COUNSELING

ADMINISTRATION

SCIENCE & ART COURT

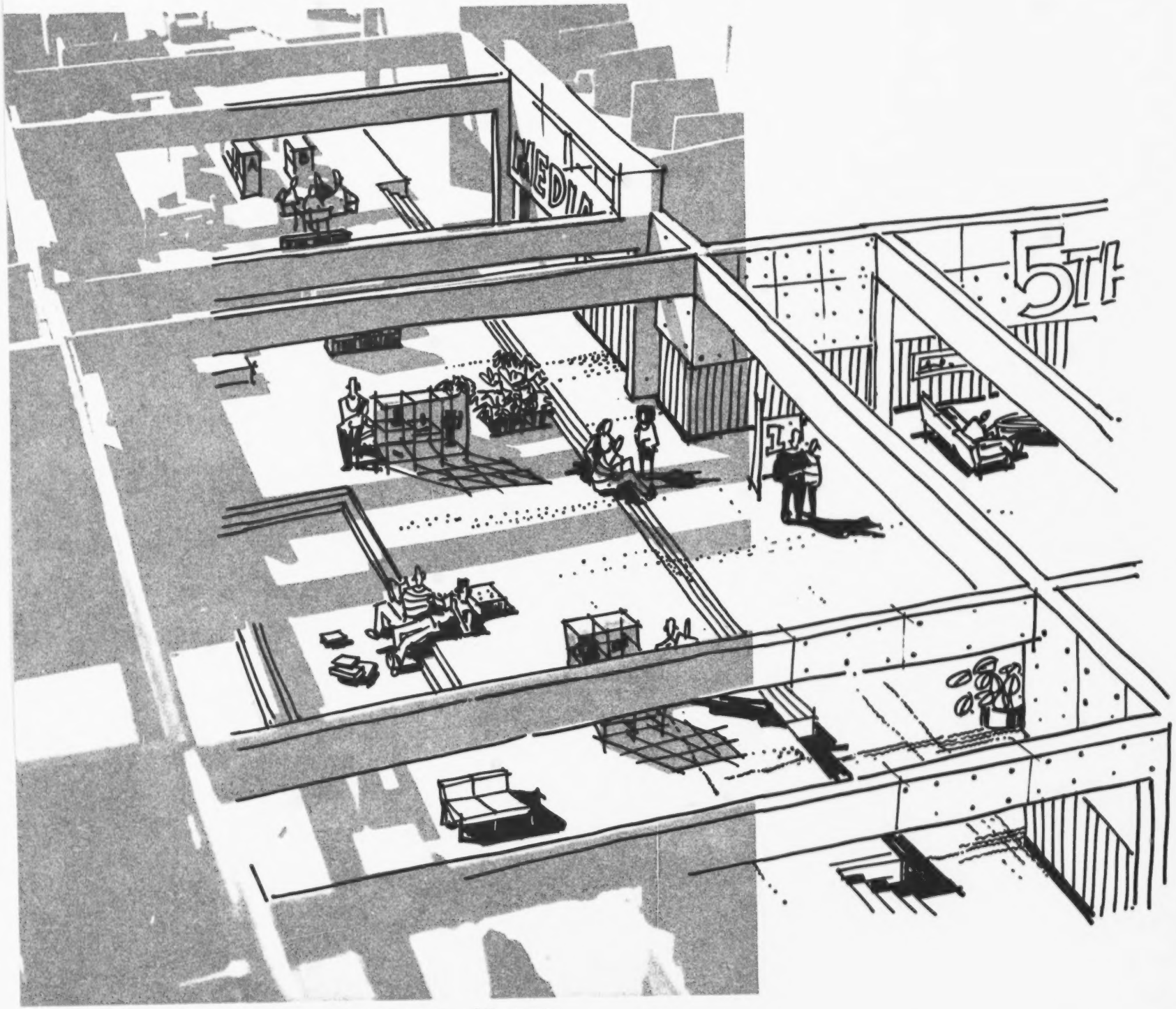
FLEXIBLE TEACHING

UPPER LEVEL GRADES

SPECIAL EDUCATION

MUSIC

KITCHEN



A view of the student commons at the intersection of the upper grades wing (left) and primary grades wing (right)

About the project

Constructed in 1953, the Marie A. Murphy Elementary School is typical of numerous "finger-plan" schools in California built during the 1940's and 1950's. Comprising several detached buildings, these "finger-plan" schools are identified by their single-story construction and their exterior covered corridors. Usually of light, framed construction, these schools are found in various plan forms but always with the "fingers" reached by the covered exterior walkways. The schools usually provide only the rows of self-contained classrooms, which are separated by open courts, and the needed administrative offices. Sometimes multipurpose facilities and a cafeteria are provided. The Murphy School has a multipurpose space and two kindergarten units, as well as the usual classrooms and administrative offices.

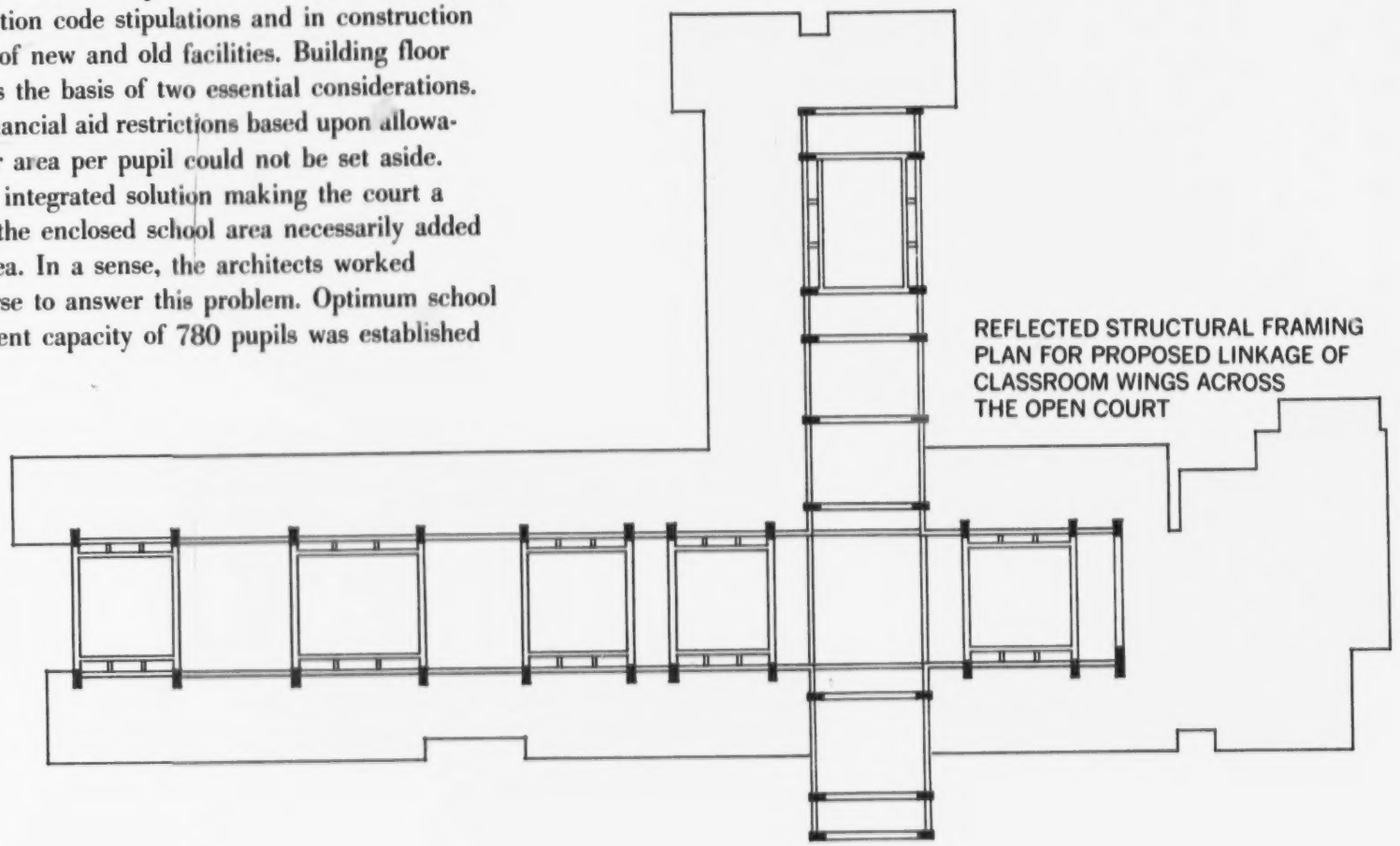
The "finger-plan" schools of the 1940's and 1950's were patterned to satisfy conditions of that era, some of which were not educational in nature. Rapid population growth in California in recent years has created a need for schoolhouses which could be met only by rapid construction of inexpensive facilities. Economic conditions restricted the amount of space which could be built, so most facilities were designed only with the needed self-contained classrooms. Other educational necessities, such as libraries and special education facilities, were either not provided or, when provided, were inadequate. Rigidity of the rows of self-contained classrooms also has prevented their adaptation to new educational methods and equipment. The Murphy School is representative of schoolhouses with these limitations. Realizing this, the Richmond Unified School District is examining ways to develop this existing "finger-plan" plant and other similar plants into more suitable facilities, which can accommodate newer educational philosophies and which will provide better facilities for flexible teaching methods, library media, and teacher-student work areas.

The design team headed by Edwards and Evans answered the problems of providing flexible teaching space and additional floor area for the future growth of the Murphy School in an unusual way. Rather than renovating present

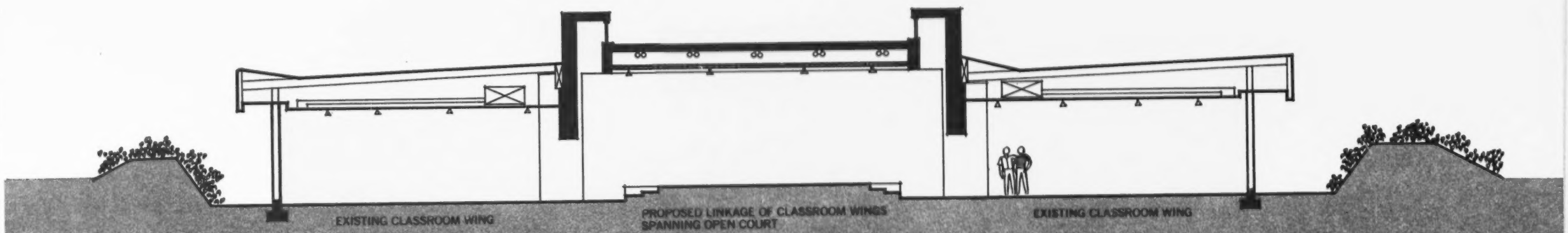
facilities and then adding the new service spaces as an appendage to the "finger-plan" school, their approach was a unique and comprehensive rearrangement of the present plant. Utilization of the two closely spaced wings of the existing schoolhouse was the key to expansion and integration of services. The architects boldly determined to expand the educational process into the court between the wings. A new roof over the court space and removal of adjoining classroom walls results in a large, open space as the core of the school. This area, suitably defined by movable partitions and furniture, allows for the teaching flexibility of group size and group arrangements sought by District administrators. Additional floor area gained from enclosing the court also permits integration of a media center, faculty work areas, individual study areas, and a flexible multiuse space into the teaching-learning areas. The altered and enlarged facility allows the entire learning experience and teacher interaction to occur within one versatile environment.

The architects' decision to develop a total learning environment within one large space grows out of their belief that a merging of activities, such as use of library media and interchangeable space arrangement, is needed rather than a separation, as generally occurs when additions are built as appendages. States Ralph Edwards: "Separated facilities are contradictory to present educational concepts." Accordingly, in their proposed solution, the media center is brought right into the learning environment, and space is arranged for its best use.

Straightforward as the proposed solution appears, the design team faced difficult problems once the basic concept was set — both in satisfying construction code stipulations and in construction linkage of new and old facilities. Building floor area was the basis of two essential considerations. State financial aid restrictions based upon allowable floor area per pupil could not be set aside. Yet, an integrated solution making the court a part of the enclosed school area necessarily added floor area. In a sense, the architects worked in reverse to answer this problem. Optimum school enrollment capacity of 780 pupils was established



REFLECTED STRUCTURAL FRAMING PLAN FOR PROPOSED LINKAGE OF CLASSROOM WINGS ACROSS THE OPEN COURT



SECTION THROUGH CLASSROOM UNIT

after the designers had first analyzed growth projections for the surrounding neighborhood and then analyzed building area resulting from enclosure of the court. Thus, future enrollment of 780 pupils (an increase from the present enrollment of 550 pupils) was established by the practicalities of pertinent conditions rather than by theorizing on optimum enrollments.

Another problem of floor area expansion had to be resolved in order to satisfy construction codes. The design solution's large, single space volume and the present light, wood framed construction necessitated accounting for all area increases allowed by building codes to satisfy the construction classification for fire rating. This included provision of a sprinkling system for the entire building. Code analysis indicated a maximum permissible building area of 54,396 sq. ft. when all area increases were considered. This maximum allowable area is in excess of the proposed schoolhouse area of 48,669 sq. ft.

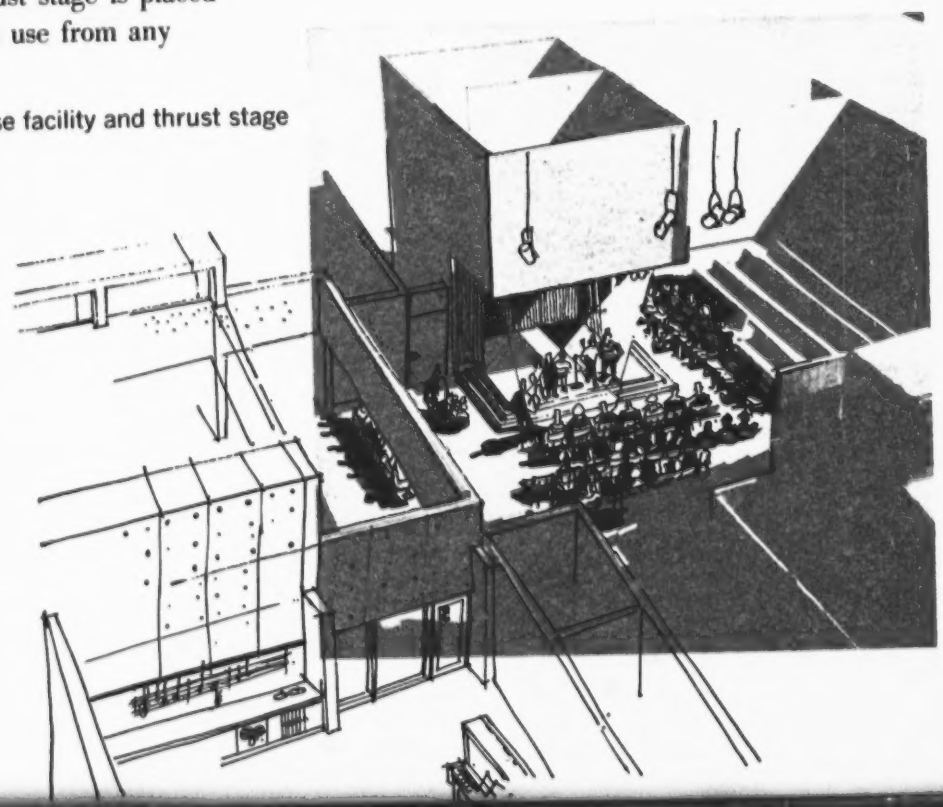
Construction linkage of the new enclosed court and the existing wings is achieved with a structural concrete spline covering the area between wings. The inverted channel form seen in cross section conveys the essence of the structural concept. Walls of the adjoining classroom wings are removed, and the existing building roofs are carried on concrete edge beams which are the sides of the channel form of the new roof. Concrete columns are spaced along the connections of the two spaces to carry roof loads to the ground.

Teaching areas, typically with no fixed walls, are created along the entire space. Specialized areas for science laboratory and art classrooms are arranged for privacy with a minimum of fixed partitions and are positioned to overlook an interior court which opens the core area to natural light. Media use areas and preparation areas are interspersed throughout the plan, and a media center is centrally positioned in the building to serve both primary and upper-grade teaching areas. A zoned plan arrangement places the primary grades in the north wing and upper grades to the west. Individual study spaces are sprinkled throughout the plan, as are teaching areas adaptable to a variety of group sizes. An enclosed music classroom has been provided along with a classroom for special education programs, also enclosed.

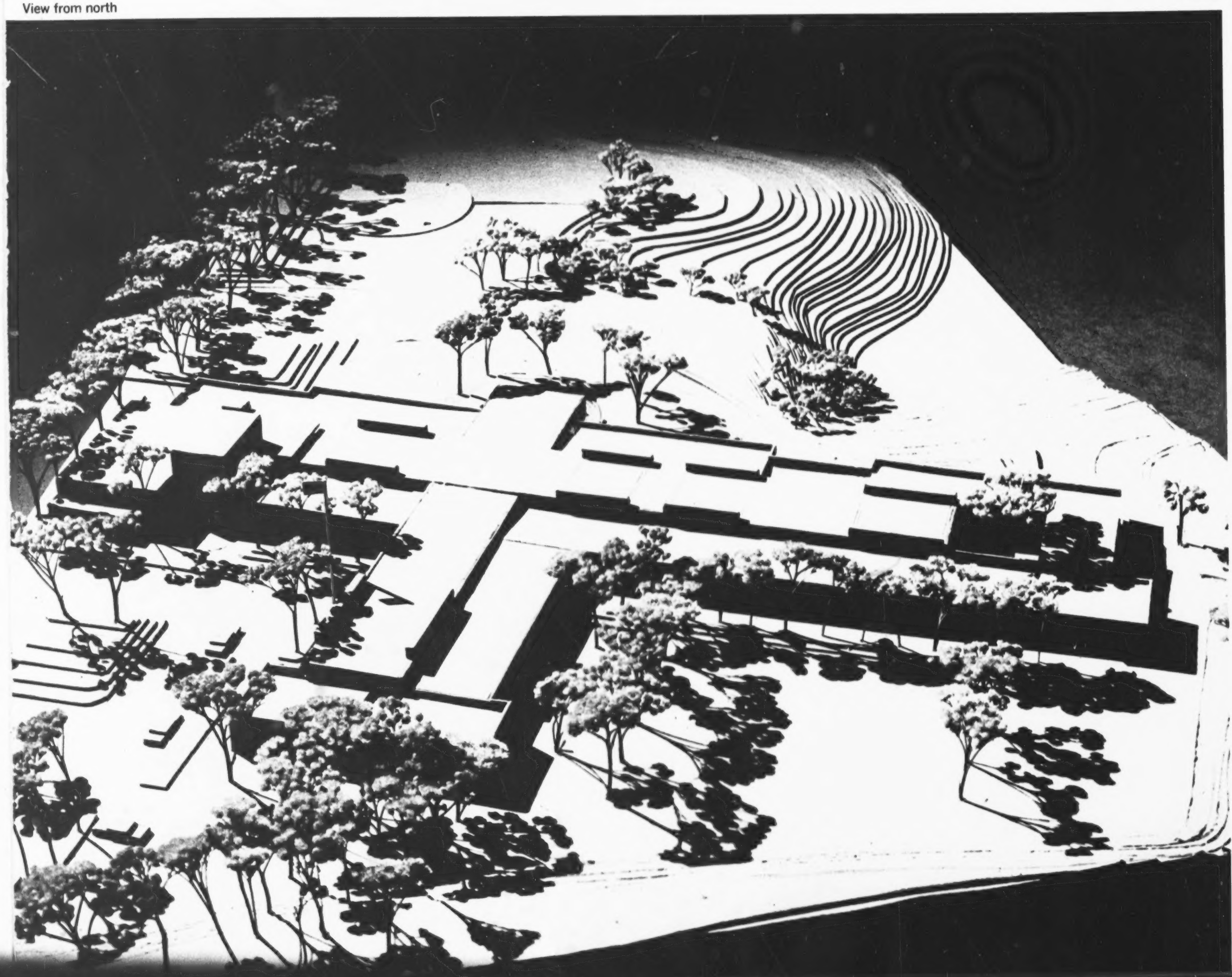
An existing; inflexible multipurpose and cafeteria space at the east end of the present building has been transformed into an especially usable and versatile feature of the school. Again, the existing wall adjoining the newly created core area has been removed. A thrust stage is placed in a position which permits its use from any one or more of three directions and accommodates a wide variety of group sizes. Still, an open area, sized the same as the present multipurpose space, has been retained for cafeteria dining, thus eliminating any need to relocate expensive kitchen equipment already there.

Integration and articulation of new construction with existing buildings is particularly successful in the solution proposed by this design team. Difficult problems associated with building additions have been resolved by means of the concrete spline. This spline is raised above the existing roof levels to add a feeling of spatial variation within a large shell, and wood framing of the present roofs is seated naturally into the concrete edge beams. Radiant heating in the present floor slabs remains, and mechanical ducts for tempered fresh air are placed in new suspended ceilings. Although many existing classroom partitions are removed for increased flexibility of space use, existing toilet room cores remain and are incorporated into the new plan. Existing exterior walls, except for those adjoining the core area, remain almost untouched. As the architects correctly observe, "plant remodeling, though appearing extensive, does not represent great changes in existing construction."

View of the multipurpose facility and thrust stage



View from north



View of the primary grades area (upper left) and media center (lower right)

Fallout protection

The same planning concept used for educational linkage also provides the desired fallout protection for the Murphy Elementary School. The fallout protected area is the newly created core space filling between the present wings. The concrete, inverted channel form over the core area suggests the basis for gaining fallout protection within the concept of a protective shell. Although the slab thickness was necessarily increased to gain the required shielding mass, the enclosure concept was not altered in the proposal. Edge beams, needed for structural stiffening and for support of existing roofs, are dropped as low as possible into the space to create the protected shell. The designers favored a change of floor levels for the core space in order to achieve a more dramatic definition within the otherwise open teaching area. The newly enclosed core area is raised about three feet to push shelter occupants up into the protective shell. Early designs were tried with a depressed floor for the core, but shielding calculations favored the raised-level solution which elevates the occupants into the shell and thereby provides improved shielding from side radiation exposure.

Light wood frame walls of the existing buildings surrounding the core provide little shielding benefit. To gain improved shielding along these side walls, earth berms are provided just beyond the wall lines and are developed at some points for exterior teaching use. Also, some new partitions of concrete block are used to gain added shielding mass for the core area.

The shelter area environment is further enhanced by allowing natural light into the space. An interior court, used for art classes and as an herbarium for science classes, is placed at one end of the core. To offset the radiation shielding loss caused by the court the designers introduced raised planting boxes and screen walls into the scheme. Another natural lighting feature is a clerestory used on each side of the raised concrete roof. These windows run parallel with the long dimension of the core and provide soft reflected light for the interior space. Even though the openings penetrate the protective roof, a baffling arrangement prevents any increase in radiation exposure inside.

The architects note that "fallout protection is no compromise to the educational program," even though their educational philosophy embodies an "open planning" concept for teaching spaces. On the other hand, they acknowledge that increased construction mass for the new core roof is additional to normal construction requirements, as are the earth berms used for side wall shielding.

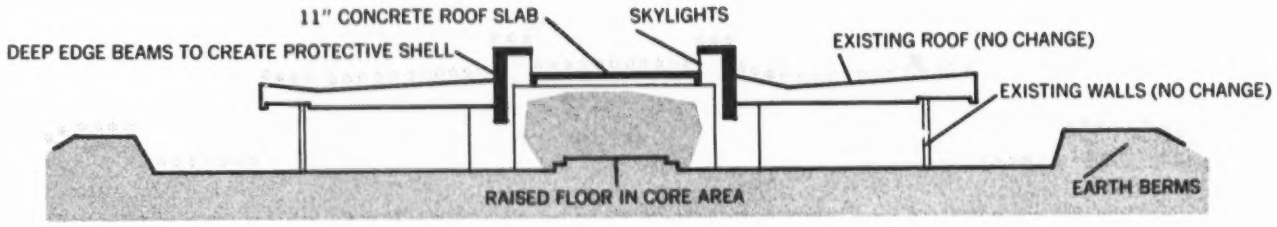
AREA SUMMARY

Existing Schoolhouse	37,113 sq. ft. total
Proposed Schoolhouse	18,669 sq. ft. total
Construction Removed	9,429 sq. ft. total
New Construction	20,555 sq. ft. total

ESTIMATED CONSTRUCTION COSTS

Demolition, New Construction and Remodeling	$ 97,226.00	
Additional Cost for Fallout Protection	31,012.00	
Total Estimated Construction Costs	$ 129,276.00	$8.82/sq. ft.[1]

[1]Based upon total schoolhouse area



HOW FALLOUT PROTECTION WAS ACHIEVED

PLAN SHOWING SHELTER AREA

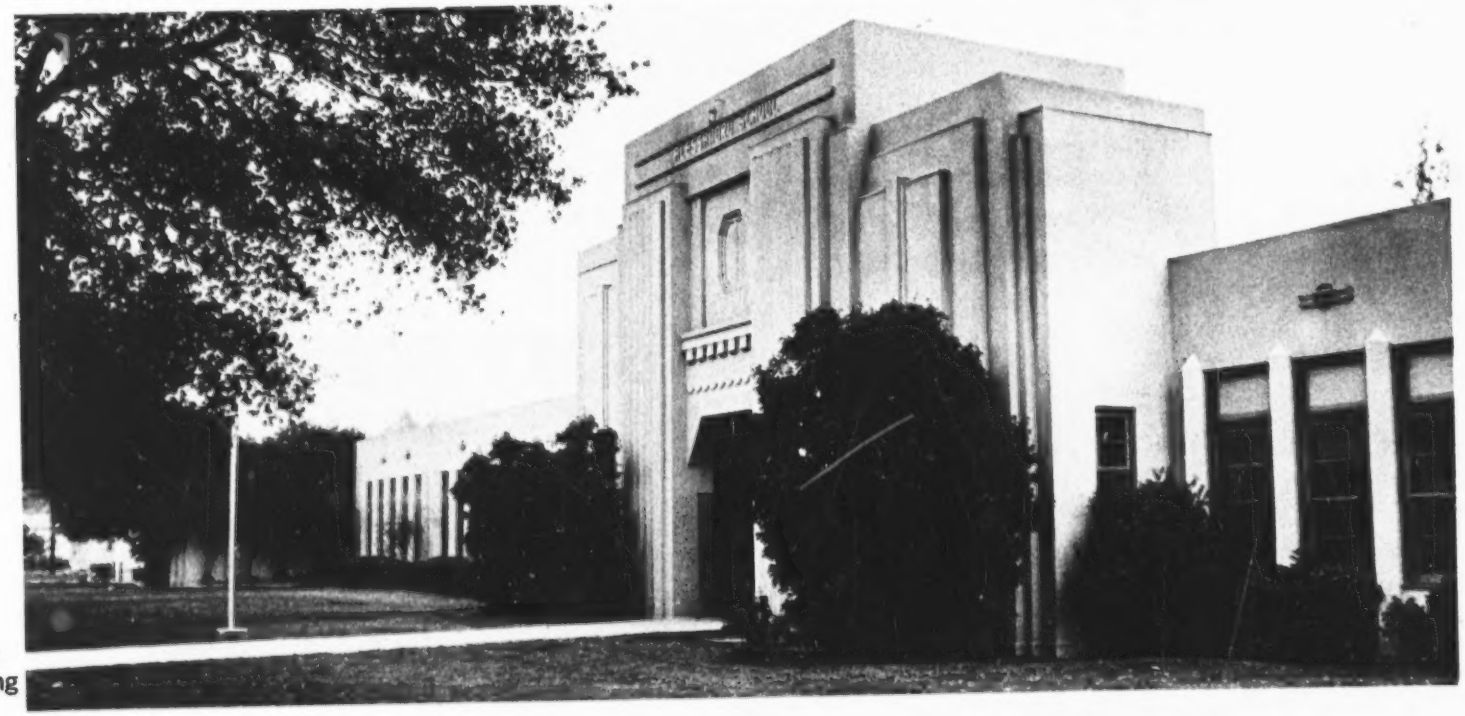
About the architect

MARIO CORBETT is the "senior member" of this design study. With an illustrious professional career behind him, he now devotes his time to lecturing and teaching. A student of Timothy Hopkins Academy of Art and the San Francisco Art Institute, Corbett, who makes his home in Los Angeles, practiced in the San Francisco area from 1933 until his recent semi-retirement. The years of practice have brought Corbett wide recognition and respect. Included in his array of accomplishments are AIA awards of Merit in 1949, 1950, and 1953. His work has been widely published, including *Progressive Architecture* in 1954 and *Architectural Record* in 1957. Corbett is named in writings of other authors, among them historian Burchard's and Bush-Brown's *The Architecture of America*, and *Who's Who in the West*. Teaching in schools of Architecture since 1951, Corbett has served as a guest critic at Yale, Stanford, University of California, Cornell, California State Polytechnic Institute, and Auburn. A recent lecture tour has taken him to universities across the United States and to Kumomoto University in Japan.

Project Educational Consultant:
Gerald E. Hansen
Instructional Consultant For Building Planning
San Bernardino City Unified School District

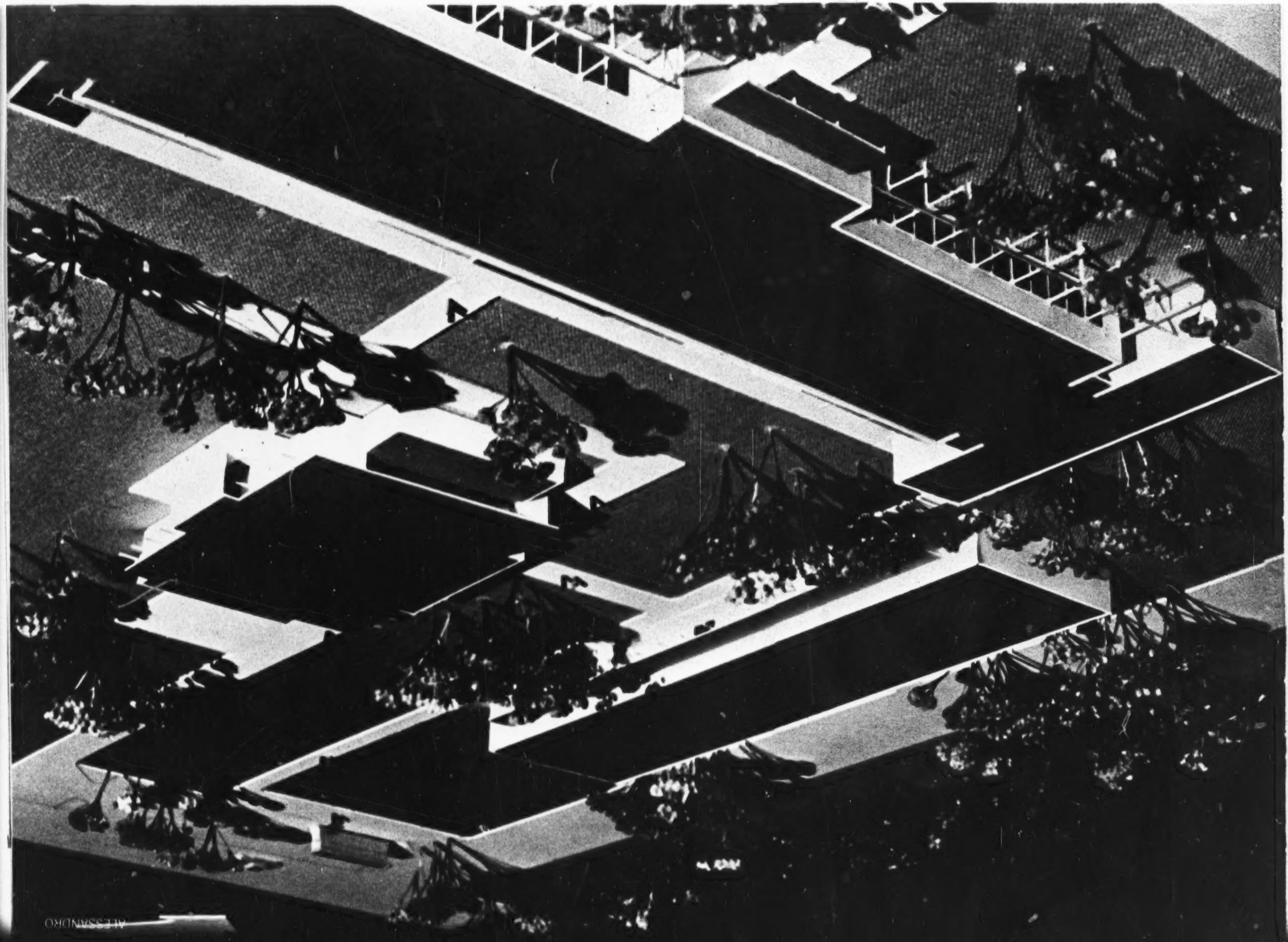
Student Design Team:
Giles Blunden
Abram Gillies
John Hunzinger
Robert Quigley
Robert Schriever

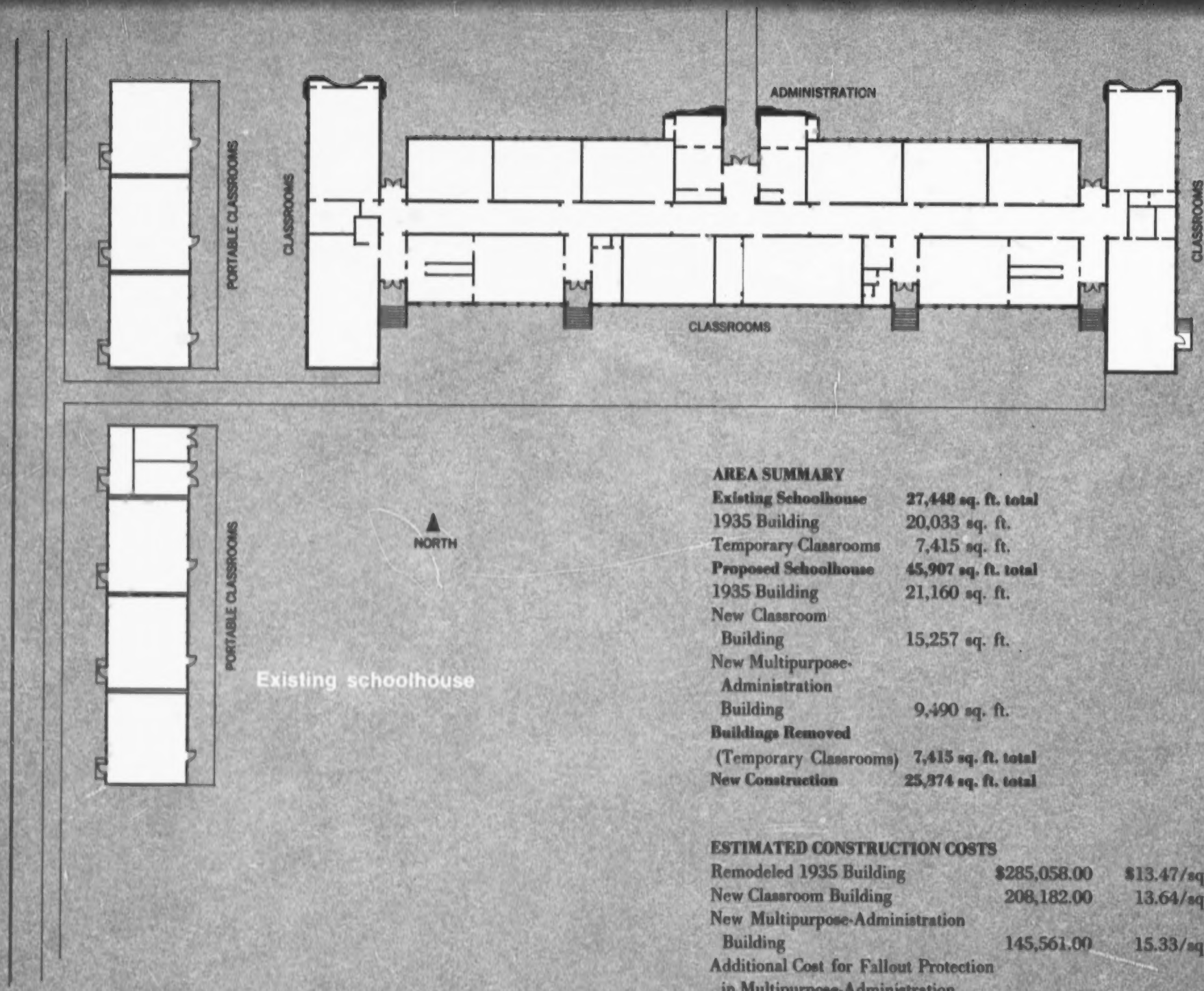
ALESSANDRO ELEMENTARY SCHOOL San Bernardino City Unified School District San Bernardino, California



North (front) facade of
1935 classroom building

South facade of
1935 classroom building


ALESSANDRO



Existing schoolhouse

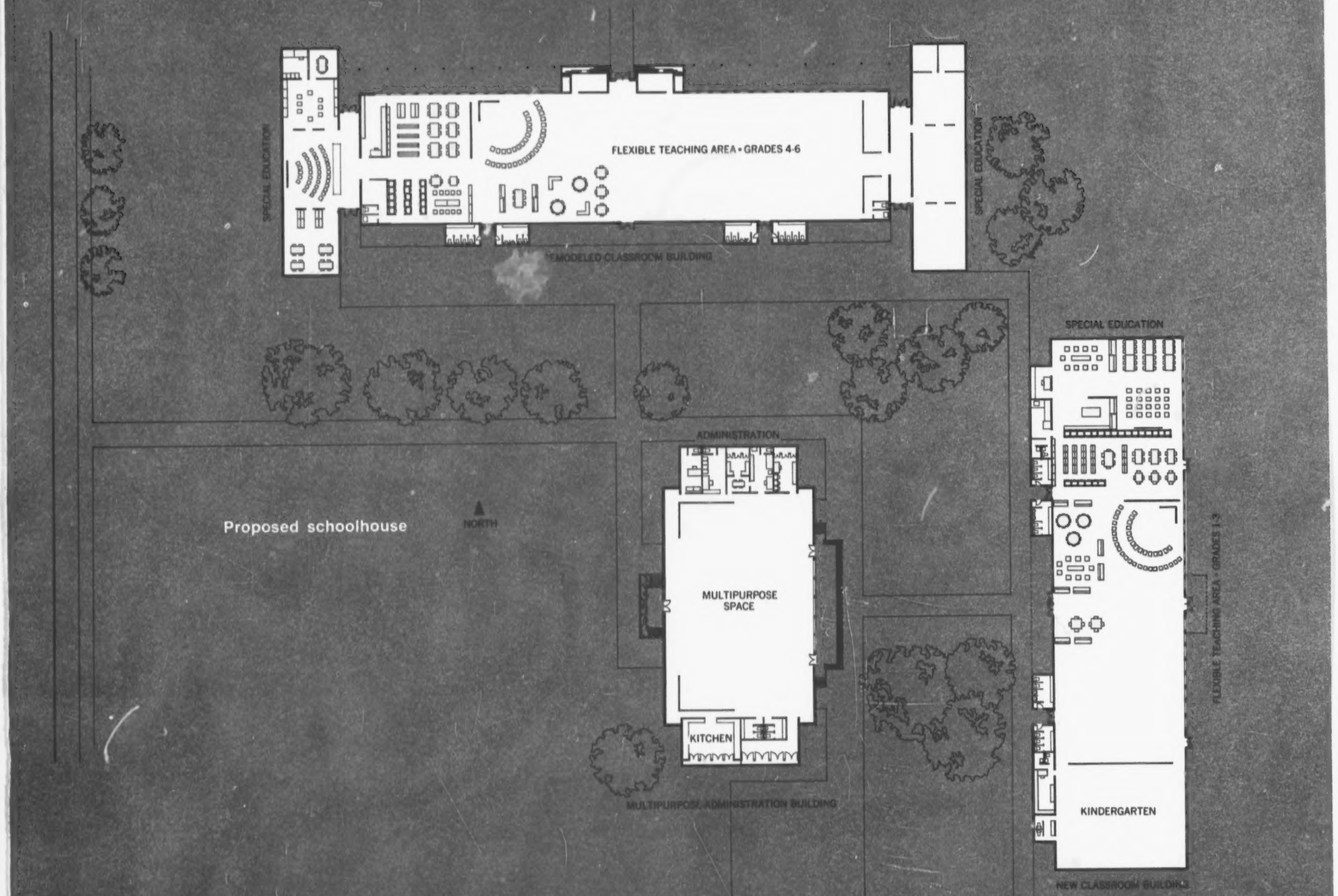
AREA SUMMARY

Existing Schoolhouse	**27,448 sq. ft. total**
1935 Building	20,033 sq. ft.
Temporary Classrooms	7,415 sq. ft.
Proposed Schoolhouse	**45,907 sq. ft. total**
1935 Building	21,160 sq. ft.
New Classroom Building	15,257 sq. ft.
New Multipurpose-Administration Building	9,490 sq. ft.
Buildings Removed	
(Temporary Classrooms)	**7,415 sq. ft. total**
New Construction	**25,374 sq. ft. total**

ESTIMATED CONSTRUCTION COSTS

Remodeled 1935 Building	$285,058.00	$13.47/sq. ft.
New Classroom Building	208,182.00	13.64/sq. ft.
New Multipurpose-Administration Building	145,561.00	15.33/sq. ft.
Additional Cost for Fallout Protection in Multipurpose-Administration Building	13,891.00	
Total Estimated Construction Costs	**$ 652,692.00**	

ALESSANDRO


SPECIAL EDUCATION
FLEXIBLE TEACHING AREA • GRADES 4-6
SPECIAL EDUCATION
REMODELED CLASSROOM BUILDING
SPECIAL EDUCATION
ADMINISTRATION
Proposed schoolhouse
NORTH
MULTIPURPOSE SPACE
KITCHEN
MULTIPURPOSE/ADMINISTRATION BUILDING
KINDERGARTEN
FLEXIBLE TEACHING AREA • GRADES 1-3
NEW CLASSROOM BUILDING

About the project

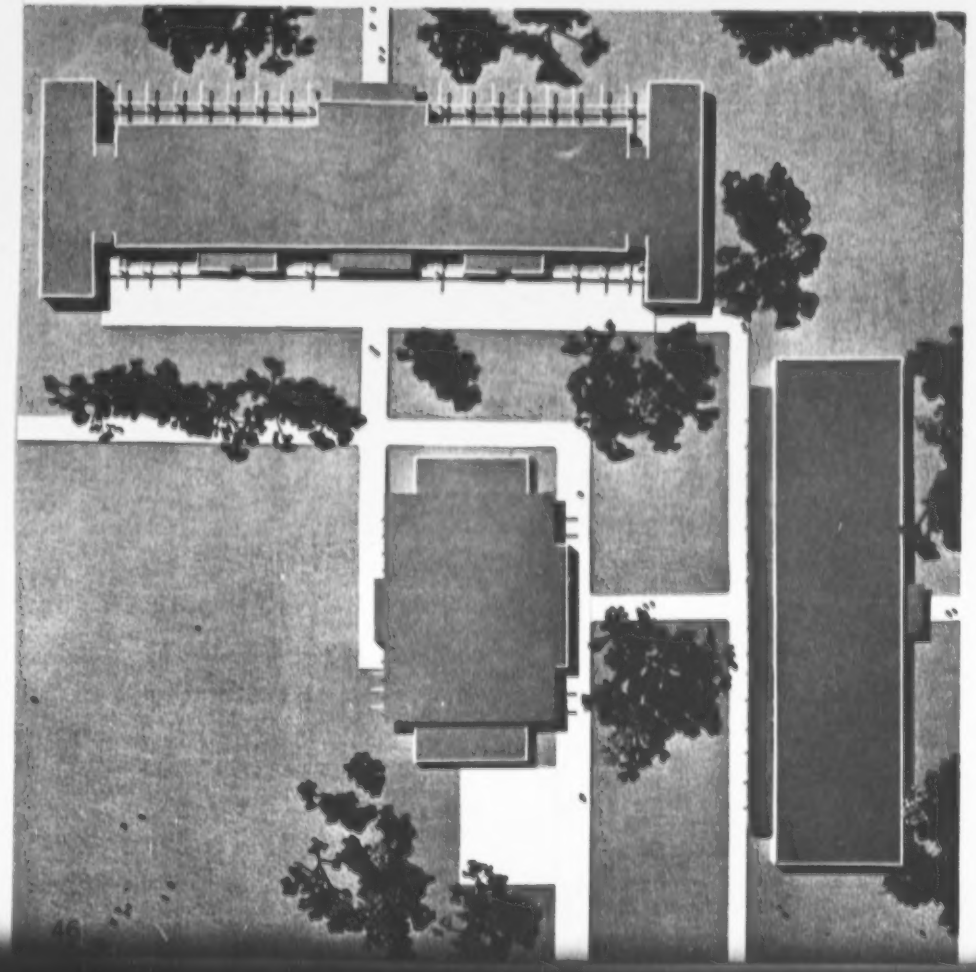
The design team for Alessandro Elementary School faced an array of serious problems in its goal to create a more viable educational facility. Not the least of the problems was an old building which was not designed to serve as an elementary school at all but rather as a junior high school. The existing schoolhouse, consisting of a one-story building dating from 1935 and a single row of temporary classrooms which were added in about 1956, presently serves grades 4-6 and will be too small to serve its projected K-6 enrollment. Present enrollment is 415 pupils; projected enrollment is 700. Making the situation all the more difficult, the present schoolhouse is without any strong architectural character. However, because of economic circumstances, it cannot be abandoned.

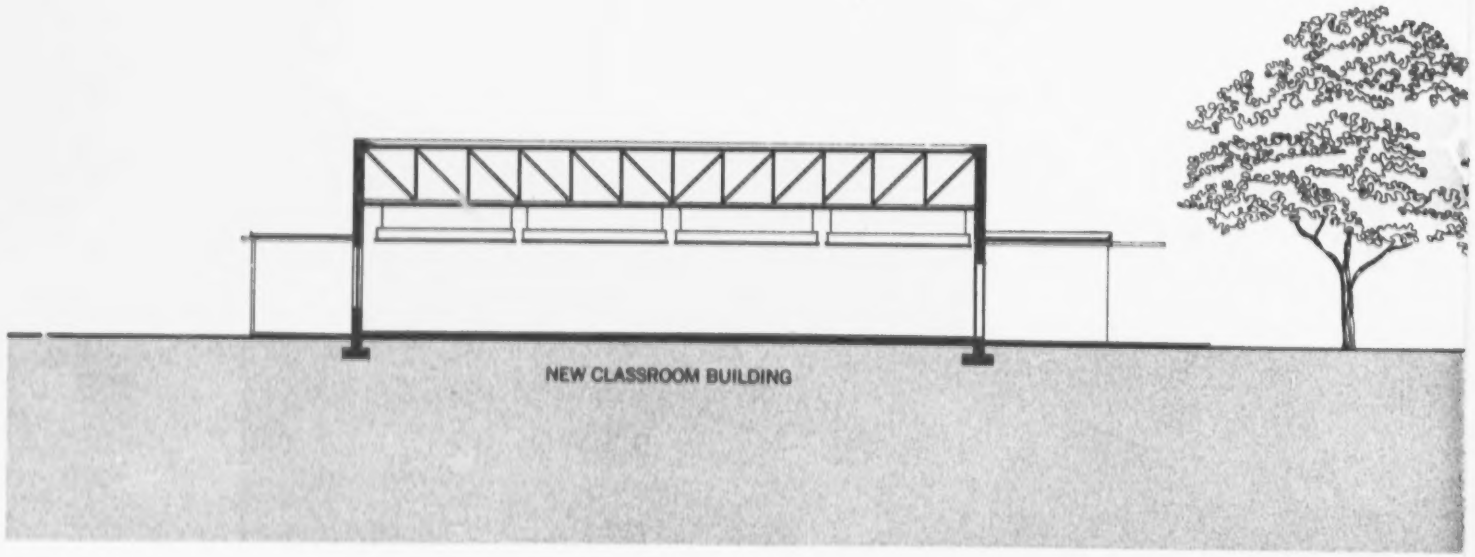
The original 1935 building fails to meet earthquake resistance criteria established by the State of California in 1933. This shortcoming stems primarily from a two-story decorative tower centered on the north facade at the building's principal entrance, to absence of lateral support in exterior bearing walls, and to absence of rigid connections between roof and walls. Alessandro School is but one of more than 35 schools in the San Bernardino City Unified School District's 56 schools which will require structural rehabilitation or abandonment to conform with recent State legislation. Some plants undoubtedly will be abandoned and demolished because of the high cost of restoration. Alessandro is not one of these.

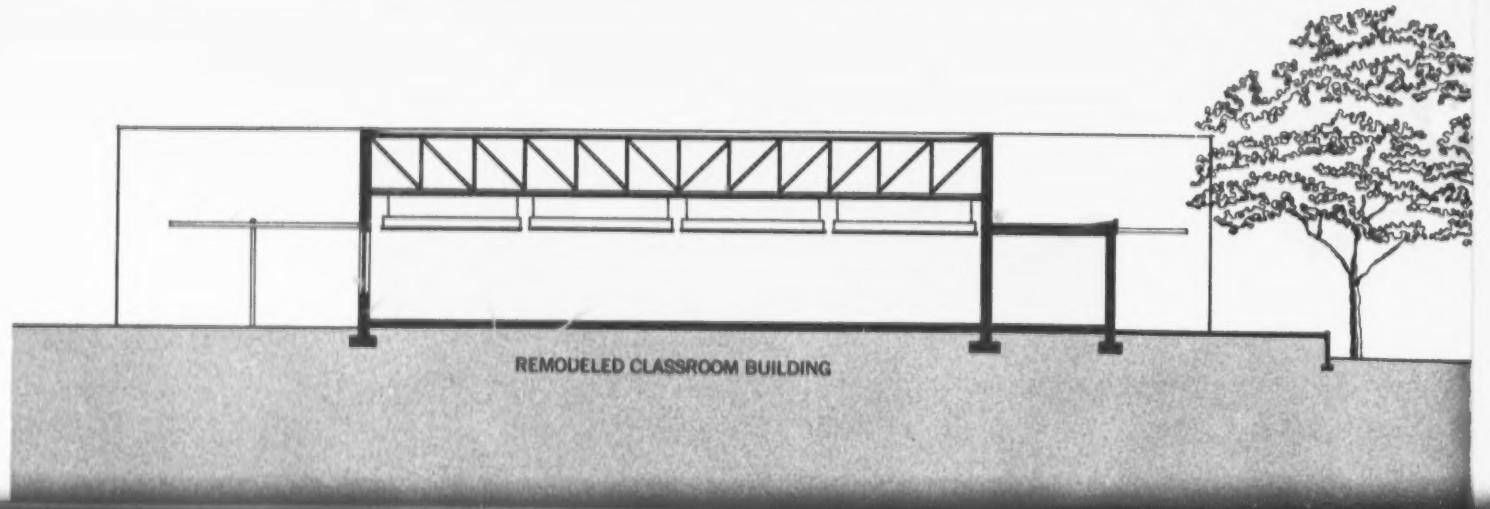
The gigantic problems the District administrators face in meeting required safety standards have caused them to undertake a comprehensive reevaluation of all schools in the system. One anticipated result of this reevaluation is an increased enrollment for the Alessandro School which necessitates structural rehabilitation. Service for grades K-6 rather than the present 4-6 will come about when another elementary school, sited about one block to the east of the Alessandro School, is abandoned. Site expansion for Alessandro, with about another five acres added to the existing 5.56 acre site, will occur when facilities are enlarged to accommodate the increased enrollment.

The District wisely has determined that structural upgrading of the present schoolhouse without an accompanying educational upgrading makes little sense. Present teaching spaces of self-contained classrooms are inefficient, inflexible, and generally inadequate to permit

Site plan







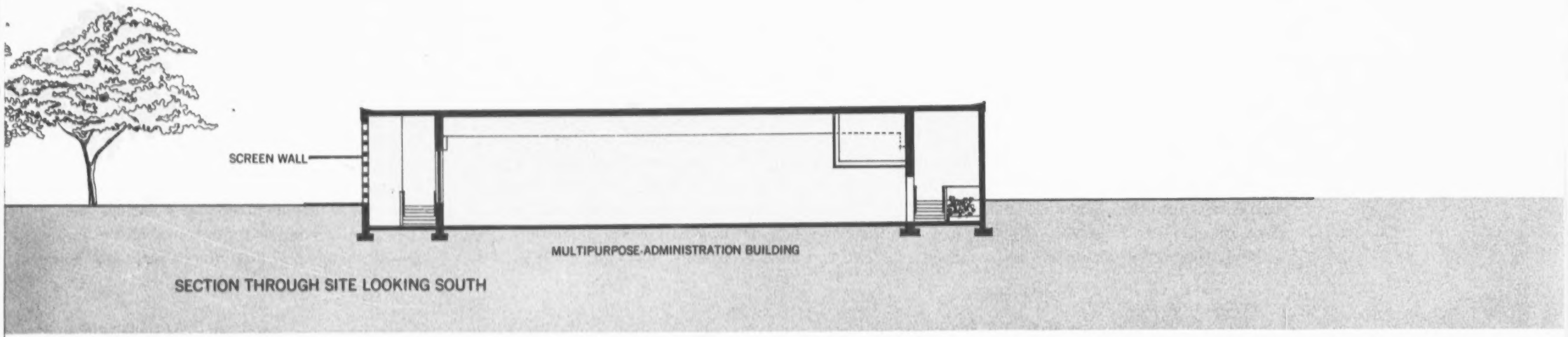
creation of the best educational environment. New service facilities for administration and library, as well as additional teaching areas, are needed for the ultimate school enrollment.

Increased attention is being given by the District to one other educational responsibility which the Alessandro School must accommodate. Drawn from the western part of San Bernardino, the school's enrollment includes an appreciable ethnic minority segment. Efforts to provide appropriate and equal education for all have resulted in increased attention to special education programs designed for those students who are educationally handicapped or retarded. The masterplan of the District envisions Alessandro Elementary School as providing some of these special facilities.

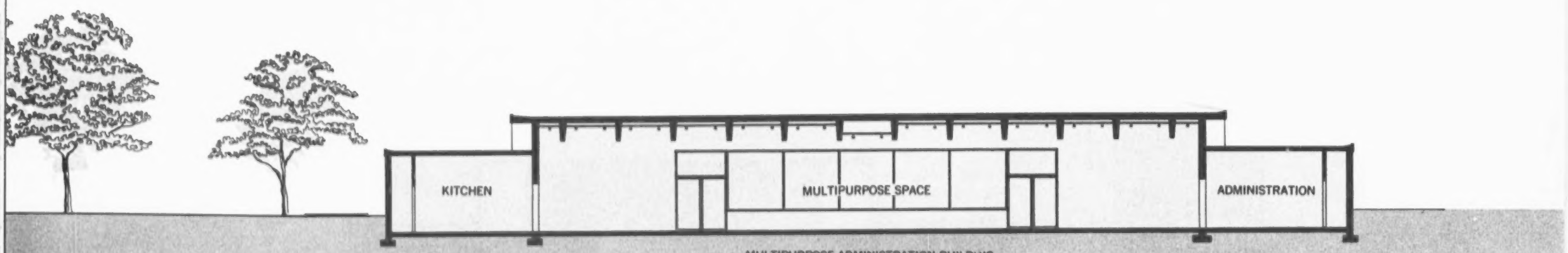
Thus, an educationally and structually inadequate building is in need of facility improvement and expansion. In his solution to these sticky problems, Corbett suggests some substantial changes in the existing plant and proposes new space for teaching, as well as new space for needed auxiliary functions. Corbett's design team has removed the temporary classrooms at the west side of the site and has replaced them with flexible teaching space at a new site location. The 1935 building has been completely altered from the floor slab up. New administration offices and a multipurpose facility have been added in a single building, sited to serve both the new classroom building and the remodeled, existing classroom building.

Removal of the temporary classroom units can be readily achieved. By their nature, these are constructed for mobility and can be transported to another school site to serve as overflow teaching areas. This will minimize loss to the District.

Corbett has corrected the structural inadequacies of the original 1935 building by removing the two-story tower on the north front and by replacing the roof. He has improved the teaching-learning environment by removing all interior partitions, eliminating the restrictions on group size and group arrangement imposed by the self-contained classrooms and creating in their place flexible teaching areas for intermediate grade pupils. Removal of interior bearing partitions along the center corridor necessitated replacing the roof over the existing building, which presently is framed with wood joists bearing on exterior walls and corridor walls. However, under any solution, major structural



SECTION THROUGH SITE LOOKING SOUTH



SECTION THROUGH SITE LOOKING EAST

changes for the roof are required to meet safety standards. The design team proposes a completely new roof of steel trusses spanning the entire space across the short dimension in order to provide complete flexibility inside. Also, wood frame and stucco exterior walls and wood windows, badly deteriorated, are replaced with block masonry construction and aluminum windows. New restroom facilities are added along the exterior of the south wall to replace existing plumbing which is substandard. By adding these facilities along the building perimeter, the designers have avoided jackhammering of existing concrete slabs for new trenches and new plumbing arrangements. Cost evaluations indicate these major renovations for this building to be economically acceptable and less than replacement cost for the facility, though greater than the limiting figure established by the District as its guideline for abandoning or renovating existing plants.

A new classroom building, housing grades K-3 and some special education facilities, has been added to the east side of the site. The designers chose to create a facility of shape and proportions resembling those of the existing building, though the educationally restricting features and structural problems of the original building have been avoided through new design. Kindergarten teaching areas and play yards are placed at the south end of this new building, where these youngsters are separated from activities of the older children. The kindergarten areas are sited in near proximity to vehicle access and parking for convenience of parents delivering and picking up the children. This site zoning developed for the proposed school also will minimize disturbances often caused by differences in schedules for the younger students.

The focus of the proposed school is a new multipurpose and administrative facility located on a triangular path equidistant from both classroom units. This facility is planned to serve for cafeteria, indoor physical education activities, and for administrative offices.

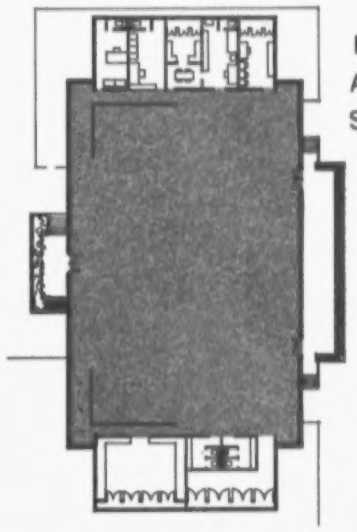
Fallout protection

Fallout protection was designed into the multipurpose-administrative facility. The protected space is in the core of this rectangular-plan building and will accommodate 656 persons if the full area is utilized. Design criteria called for a protection factor of 40; wall and roof masses were adjusted until a value just in excess of that was achieved.

Provision of fallout protection in an aboveground, single-story building which normally would be of light construction is a difficult and challenging task, if the cost for doing so is to be held low. Such building types contain few, if any, construction features which lend themselves to good shielding, yet the majority of California schools are of this type, either of wood frame or masonry construction. Hence, the problems faced by Corbett in gaining fallout protection are representative of numerous situations in California and in other States where solutions to economical fallout protection are wanted. This facility by the Corbett design team offers one solution to the problem.

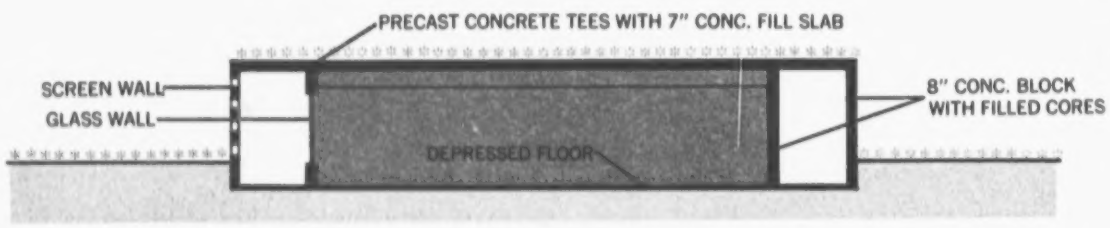
The only choice available to Corbett was to increase material mass for the building enclosure. Techniques often suggested for achieving shelter by basement space and two- or three-story construction simply are unacceptable to the educational intent of single-story schoolhouses. This single option caused Corbett to accept heavier construction for the facility than otherwise would have been necessary. However, by judicious design of plan arrangements and by creating several other conditions beneficial to improved shielding, Corbett achieved the required protection factor of 40 without resorting only to heavier walls and roof.

Overhead protection was possible only by use of a concrete roof covering. After consideration of an economical alternative, Corbett chose to use a concrete precast tee system and placed a fill slab over this. By dropping the building three feet into grade, he was able to reduce the exterior wall mass below that which would have been required for an on-grade structure to provide acceptable shielding. The floor plan arrangement also contributes to improved shielding in that interior partitions enclos-



PLAN OF MULTIPURPOSE-ADMINISTRATION BUILDING SHOWING FALLOUT PROTECTED AREA

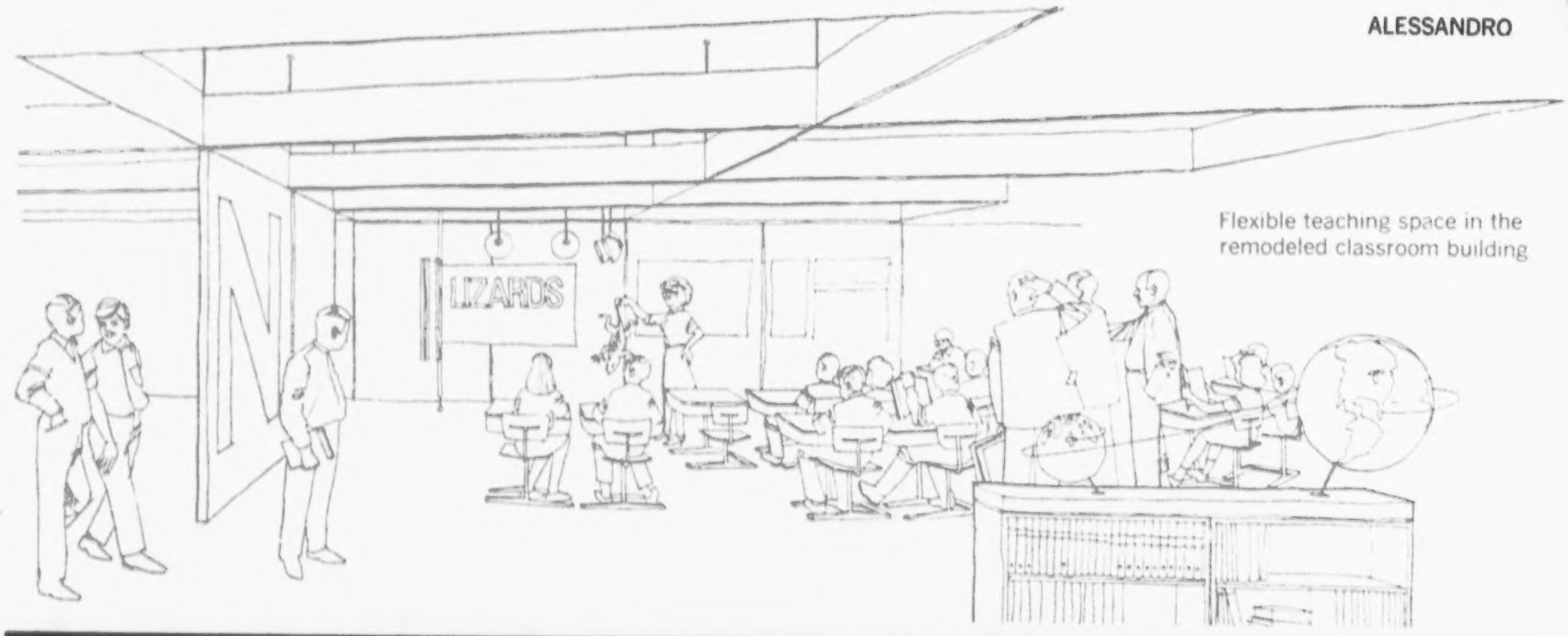
HOW FALLOUT PROTECTION WAS ACHIEVED



The east wall of the multipurpose-administration building uses a masonry grille in front of a glass wall to introduce daylight into the multipurpose space without exposing shelter occupants of the space to excessive amounts of radiation. The grille is assembled from specially cast concrete block, as illustrated. The angular assembly permits daylight penetration but would eliminate a high percentage of fallout radiation.

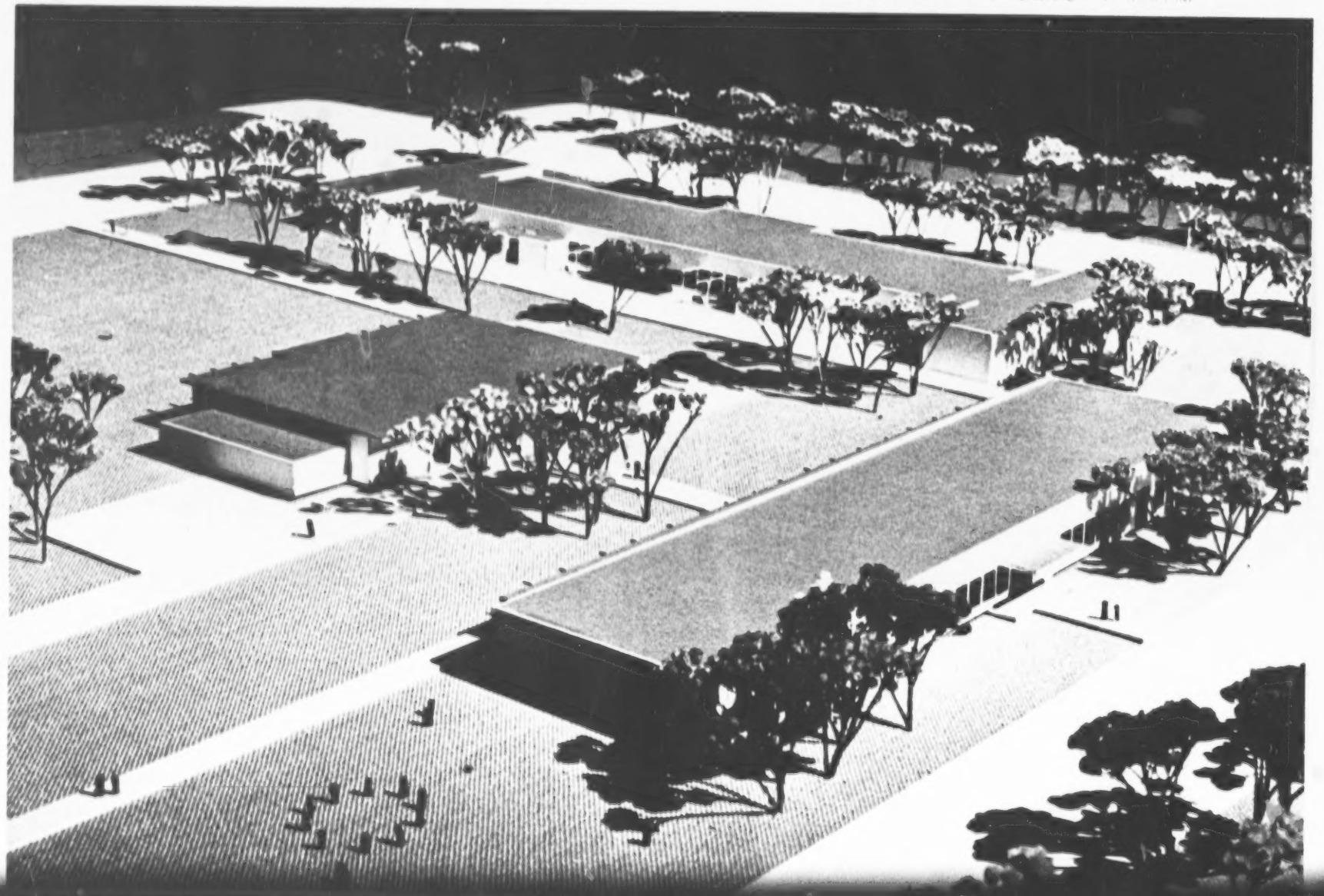
ing service and administration spaces on two sides can be used as additional shielding material. Block enclosure walls, used for the two classroom units, also were used for the multipurpose building. However, concrete aggregate block is used rather than light aggregate block. The block serves both for shielding and as bearing for roof construction. Their use as structural elements required that cores be filled with slush concrete and reinforced to resist seismic loadings. Increased barrier mass for radiation shielding is one additional benefit of this construction technique, which is required for the classroom units as well as the building to serve as a shelter.

With the conviction that natural daylight is an environmental necessity, "especially as kindergarten children are involved," Corbett developed a screen-wall detail which will allow natural daylighting into the multipurpose facility through a glass wall on the south side. By careful consideration of the voids in the screen-wall, Corbett allows the wanted lighting and visual link to the outside but still provides the needed radiation shielding. A baffle wall at the north entrance into the facility is provided to eliminate a shielding weak point.

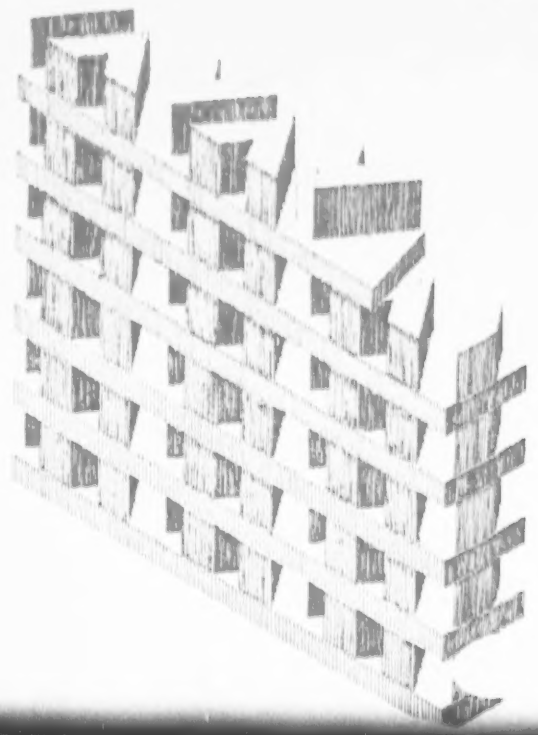


ALESSANDRO

Flexible teaching space in the remodeled classroom building



View from southeast



About the architect

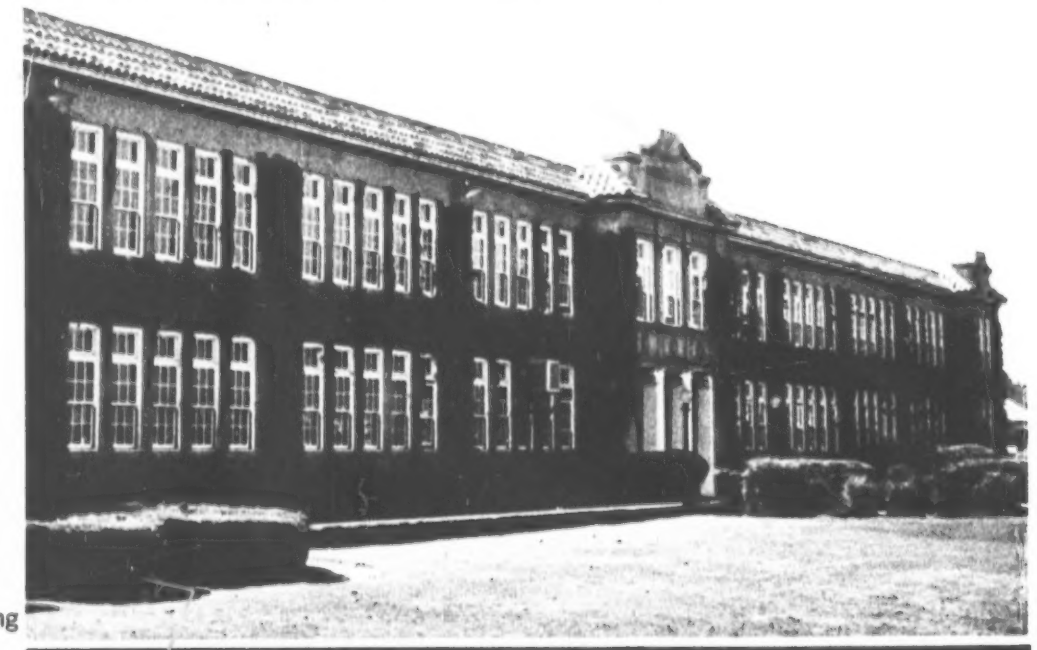
WILLIAM C. MUCHOW, FAIA, heads the accomplished and widely respected firm of W.C. Muchow Associates, Denver, Colorado. A nationally recognized designer, Muchow participated in a similar OCD-sponsored design study program at the University of Kentucky in 1965. A graduate of the University of Illinois, he later received a Master's degree in architecture and urban planning from Cranbrook Academy of Art. He is a Lifetime Fellow in the International Institute of Arts and Letters and has served on the Colorado State Board of Architectural Examiners since 1962. In recognition of his contribution to design, Muchow was elected a Fellow of the American Institute of Architects in 1968.

GEORGE S. HOOVER from Muchow's office participated in the initial study phase of this project.

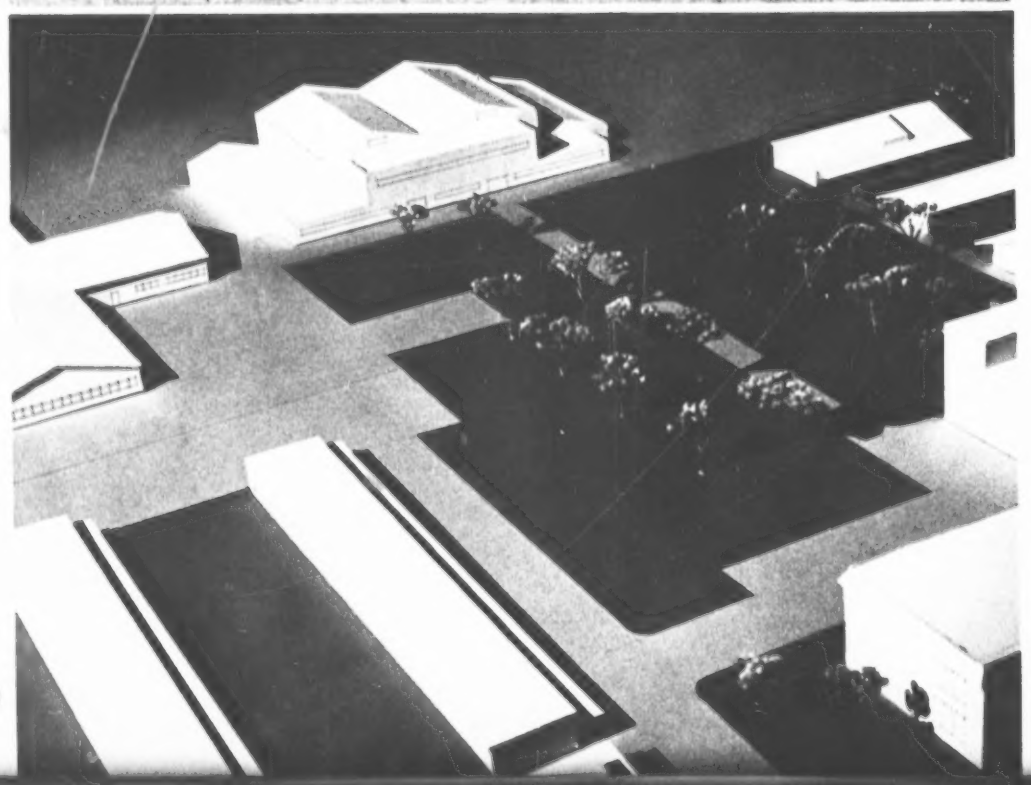
Project Educational Consultant:
William P. Booth
Project Staff, Interagency Planning for Urban Educational Needs
Fresno City Unified School District

Student Design Team:
Jerry Germer
Robert Hatfield
David Obler
Clyde Weber
David White

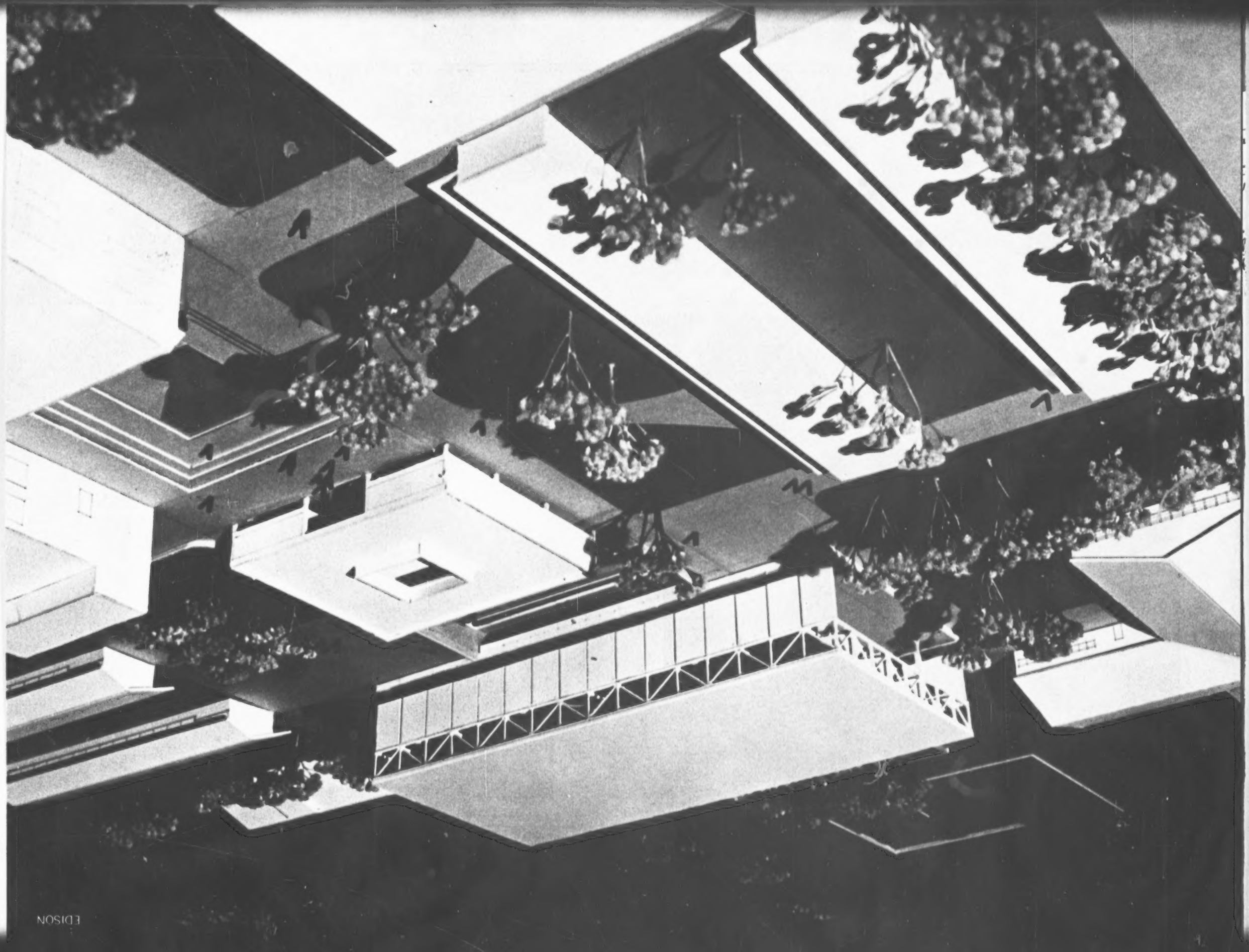
EDISON HIGH SCHOOL Fresno City Unified School District Fresno, California

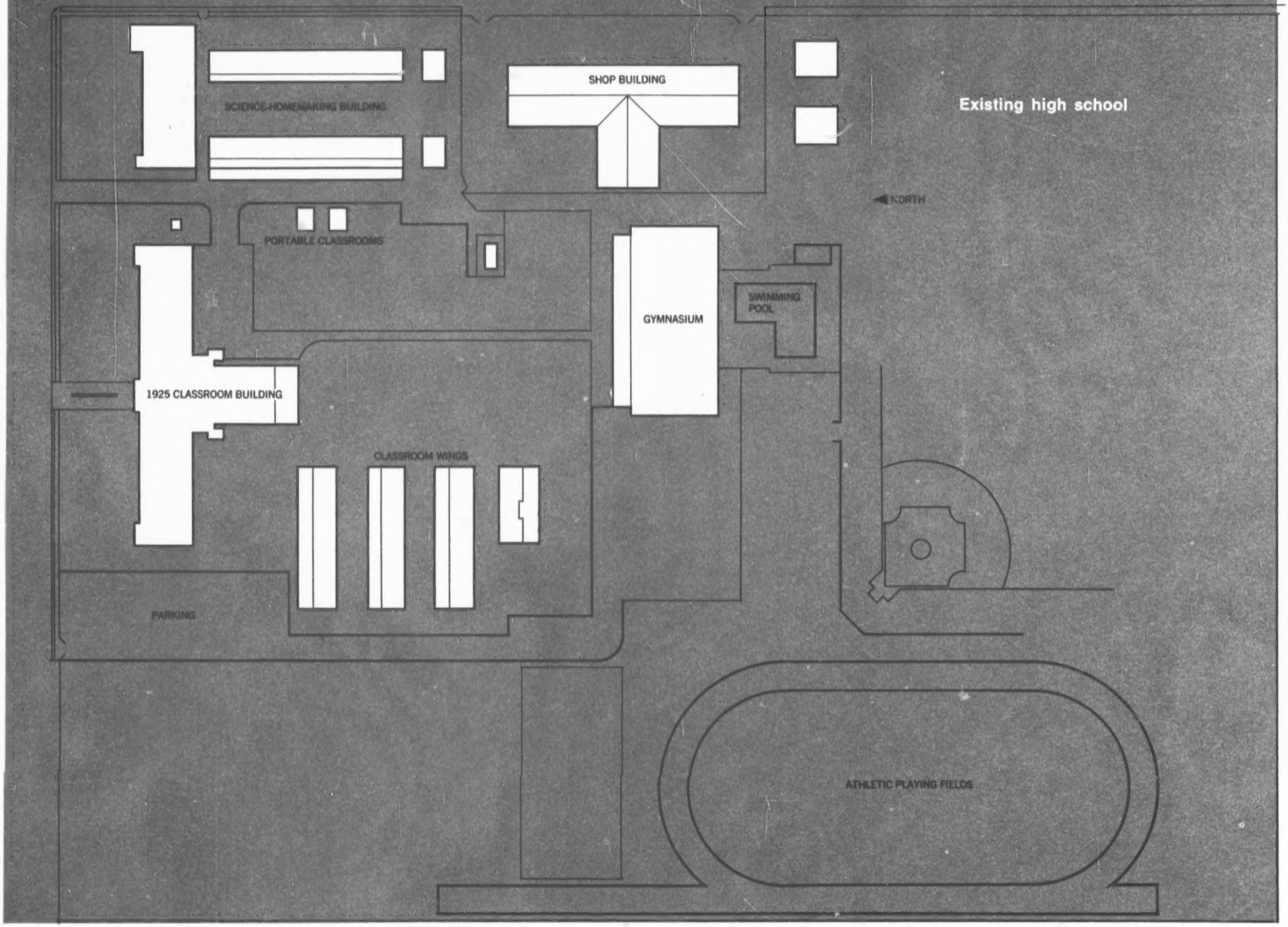


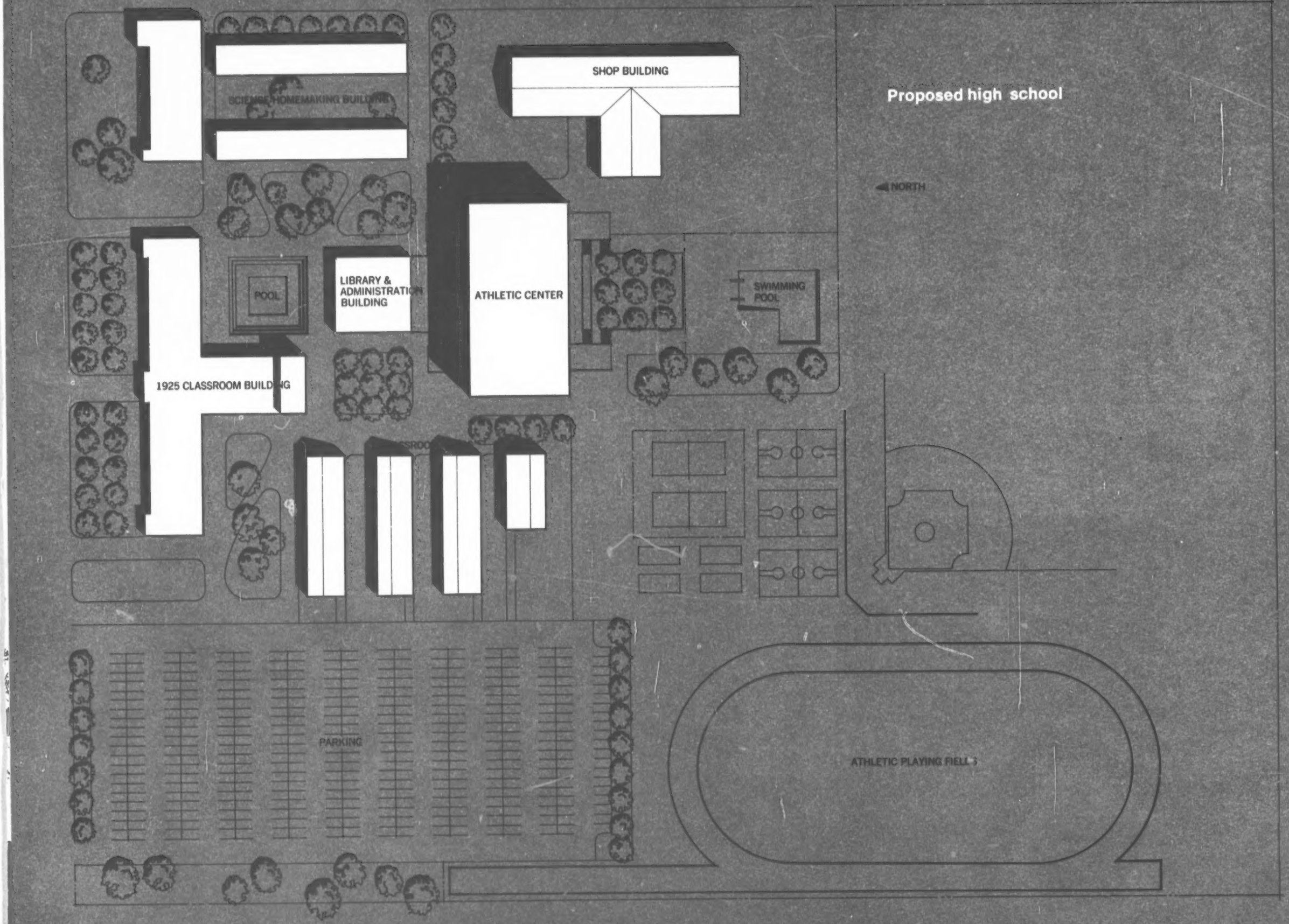
North facade of 1925 classroom building

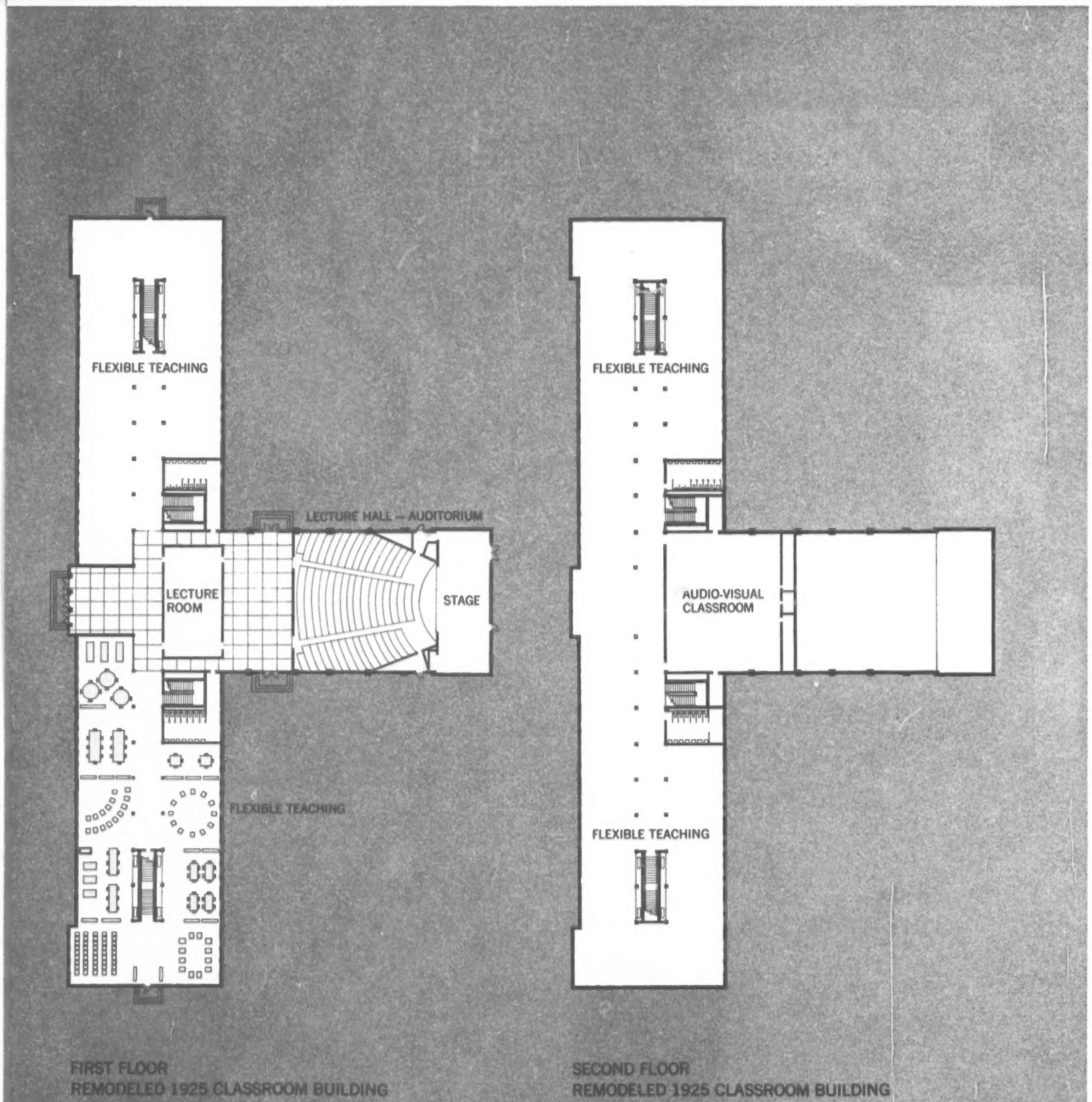


Existing high school from north showing gymnasium (top) and open plaza (center)


EDISON


SCIENCE-HOMEMAKING BUILDING
SHOP BUILDING
Existing high school
NORTH
PORTABLE CLASSROOMS
GYMNASIUM
SWIMMING POOL
1925 CLASSROOM BUILDING
CLASSROOM WINGS
PARKING
ATHLETIC PLAYING FIELDS


Proposed high school
NORTH
SHOP BUILDING
SCIENCE-HOMEMAKING BUILDING
POOL
LIBRARY & ADMINISTRATION BUILDING
ATHLETIC CENTER
SWIMMING POOL
1925 CLASSROOM BUILDING
PARKING
ATHLETIC PLAYING FIELDS



FIRST FLOOR
REMODELED 1925 CLASSROOM BUILDING

SECOND FLOOR
REMODELED 1925 CLASSROOM BUILDING

About the project

How can you upgrade an existing, old and complex high school plant to meet today's educational requirements? How can you reorganize the plant internally to allow better functional relationships between academic programs? Can an existing schoolhouse have its face reoriented to the community rather than continue with its back turned to the neighborhood? With major structural renovations necessary, how much should you remove? How much needs to be added? These are among the difficult questions faced by this study team in its redesign of the Edison High School.

Reflecting its growth by successive additions, Edison High School offers little architectural continuity, virtually no functionally workable plan relationships, and little excitement for its users. Yet, the plant is large, representing considerable investment, and the District cannot justify abandoning it even though extensive and expensive structural modifications are required for some of the older buildings. This situation, while specifically describing Edison High School, is representative of numerous similar situations in California and elsewhere. The challenge is to conduct a metamorphosis of these tired old plants into new educational mechanisms capable of competing with new neighbors, not only for the ensuing decade but for 20 or 30 years into the future.

The present plant serving this comprehensive high school is basically of a "campus-plan" type. The several buildings were constructed over a considerable period of time, beginning with the original two-story classroom building in 1925. A gymnasium and swimming pool were added to the site in 1927, science classrooms and cafeteria in 1941, additional classrooms in 1953, and more recently a large vocational automotive shop.

The school is sited in West Fresno, an ethnic minority neighborhood mostly of low income families. The present enrollment of 1,100 in grades 10-12 is almost completely Negro and Mexican-American.

Edison High School is but one of more

than 20 schools in the District's approximately 75 schools which require structural rehabilitation to conform to State legislative and construction code requirements for seismic resistance. As with other school districts in the State, this sizable problem has encouraged complete reappraisal of the entire school system. That effort is now in progress. Present thinking is that Edison will remain a comprehensive high school and will continue with strong emphasis on compensatory education to serve the minority neighborhood. Physical plant implications of a compensatory program mean primarily that more teaching spaces are required than normally, for the principal effect is reduced size of classes to permit increased individual pupil-teacher contact. Projected school enrollment is for 1,400 pupils in grades 10-12.

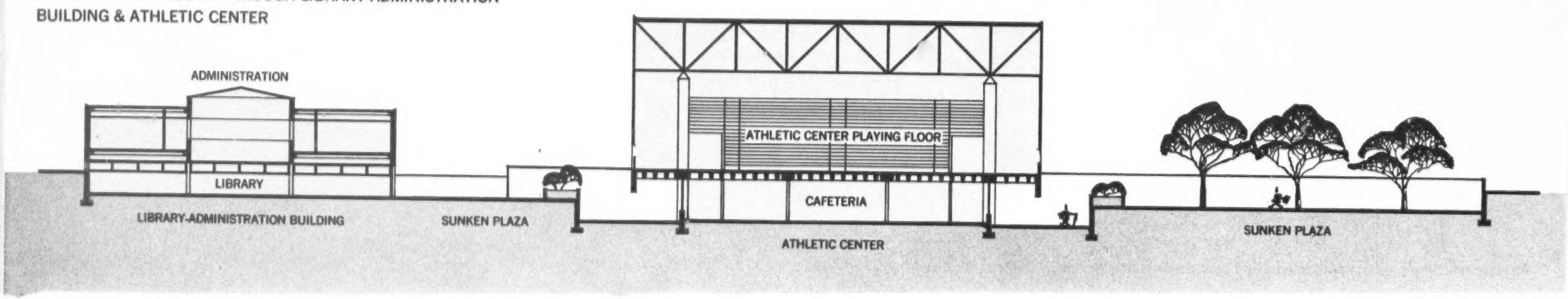
Recognizing a need for other community services to be offered by the school, planners of the future program anticipate development of a community-related athletic and recreation facility to be used jointly by the school and neighborhood. Also, a new school media center is to be planned for community use and enrichment as well as for school use.

The overall plan proposed by the architect is premised upon a new campus core, with those facilities to be used jointly for educational activities of the school and community emerging as the central focus of the core. Muchow has described his approach as "social" rather than "architectural." The intent, he states, is to "entice people of all ages into the center of the campus." For them, he has designed a new athletic center, a cafeteria, administrative offices and a library-media center within the central court. An attempt has been made to provide a variety of kinds of spaces to explore, through depressed courts and raised areas, a pool of water to sit around, spaces for active recreation and spaces for passive activities. Says Muchow, "This space should not be a static one." The basic court space presently exists but is much too large and lacks interest. Muchow suggests that present space may be undesirable because undue roominess between buildings results in an area so vast that it lacks human scale. A basic purpose, he says, for placing the media center right in the middle of the open space and the athletic center nearer the present buildings is to create a more intimate, and therefore more inviting, exterior space than now exists.

All of the new facilities intended for combined community and school use are compactly positioned for efficient operation and effective supervision. Still, even with their central campus location, all facilities are accessible to the surrounding community. Locker rooms are placed where they can serve the athletic center as well as playing fields and the existing swimming pool. Muchow even suggests that the cafeteria might well serve the neighborhood and business community besides the high school students. He describes his specific building solutions, not as what necessarily ought to be, but as an "indication of where things might occur to achieve an optimum school-community interaction." In this scheme, learning is but one part of that interaction. An attempt has been made to create an exciting environment that would attract the entire community, regardless of age.

The athletic center and library building were positioned to add definition to a presently scattered arrangement of buildings. He uses the facilities as an integrating mechanism for the existing buildings. The program requirement for improved community service in these new facilities also

SECTION NORTH-SOUTH THROUGH LIBRARY-ADMINISTRATION BUILDING & ATHLETIC CENTER



Library level of library-administration building

Flexible teaching area of remodeled 1925 classroom building

helped Muchow to determine their location as a "hub" of the new campus. He placed both facilities within a large sunken plaza. Athletic center and administrative offices are set approximately at grade level, with cafeteria and library accessible from the plaza level. The plaza actually consists of two levels, each with a six foot drop, to give a transition to those spaces developed under the floor of the athletic center.

The smaller two-story library and administration building is placed on the middle plaza level with the library facing onto this plaza in an arrangement which permits controlled use of the space for outdoor reading and exhibits. Muehow explains his plaza scheme as a means of achieving a cooler working environment in the temperature extremes of this area, the hot and dry San Joaquin Valley, and also for development of a fallout shelter area which is inherently well protected.

The scheme for a new athletic center and library social core for Edison High School anticipates removal of the present gymnasium facility, a pre-1933 building. Although a structural engineering survey of the reinforced concrete, steel and wood framed building indicates that it can be upgraded to required safety standards at modest cost, the architect deemed it generally unworkable and not feasible to restore. All other existing buildings are retained in the scheme, although the original 1925 building is substantially altered. The 1925 building, presently housing self-contained classrooms, administrative offices and a small, inadequate library, was recently surveyed and stated to be structurally sound and safe, except for needed removal of loose ornament and roof tile. Educational inadequacy is the basis of Muchow's sweeping alterations of this building. Self-contained classrooms which originally were designed for 30 pupils now serve an average of only 10 persons in the present school curriculum. The architect has removed interior space divisions to provide completely open and flexible teaching areas on both floors. Large areas, interrupted only by interior structural columns, are left to be divided by movable furniture into any type and size of instructional spaces.

A large auditorium, attached to the 1925 classroom building, also is altered in the proposed scheme. The District has considered removing this badly shaped facility. Instead, by moving the rear wall closer to the stage area, Muchow has transformed the auditorium into a smaller and more workable lecture hall-auditorium seating 500. The space opened up is converted into a lobby and now permits circulation access to the classroom building from the athletic center, heretofore not possible. The lecture hall is made a part of the community-oriented core of the campus.

Science classrooms, shop and "finger-plan" classrooms remain essentially unchanged in the new scheme, except for the relocation of the cafeteria from the science classroom unit to the new athletic center.

This solution for Edison High School has achieved an improved educational usefulness without addition of new classroom space. While the total plant area has been increased, most of this gain is in new library and administration facilities. Thus, some increased teaching space is gained in the displaced library and administration areas of the classroom building. But, of more importance, the new scheme provides greater flexibility of group size and arrangement and, therefore, permits increased efficiency in use of the teaching-learning space.

than 20 schools in the District's approximately 75 schools which require structural rehabilitation to conform to State legislative and construction code requirements for seismic resistance. As with other school districts in the State, this sizable problem has encouraged complete reappraisal of the entire school system. That effort is now in progress. Present thinking is that Edison will remain a comprehensive high school and will continue with strong emphasis on compensatory education to serve the minority neighborhood. Physical plant implications of a compensatory program mean primarily that more teaching spaces are required than normally, for the principal effect is reduced size of classes to permit increased individual pupil-teacher contact. Projected school enrollment is for 1,400 pupils in grades 10-12.

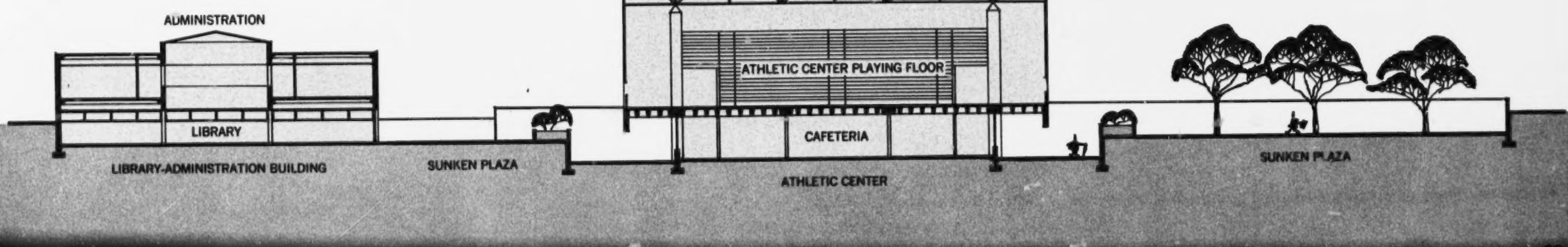
Recognizing a need for other community services to be offered by the school, planners of the future program anticipate development of a community-related athletic and recreation facility to be used jointly by the school and neighborhood. Also, a new school media center is to be planned for community use and enrichment as well as for school use.

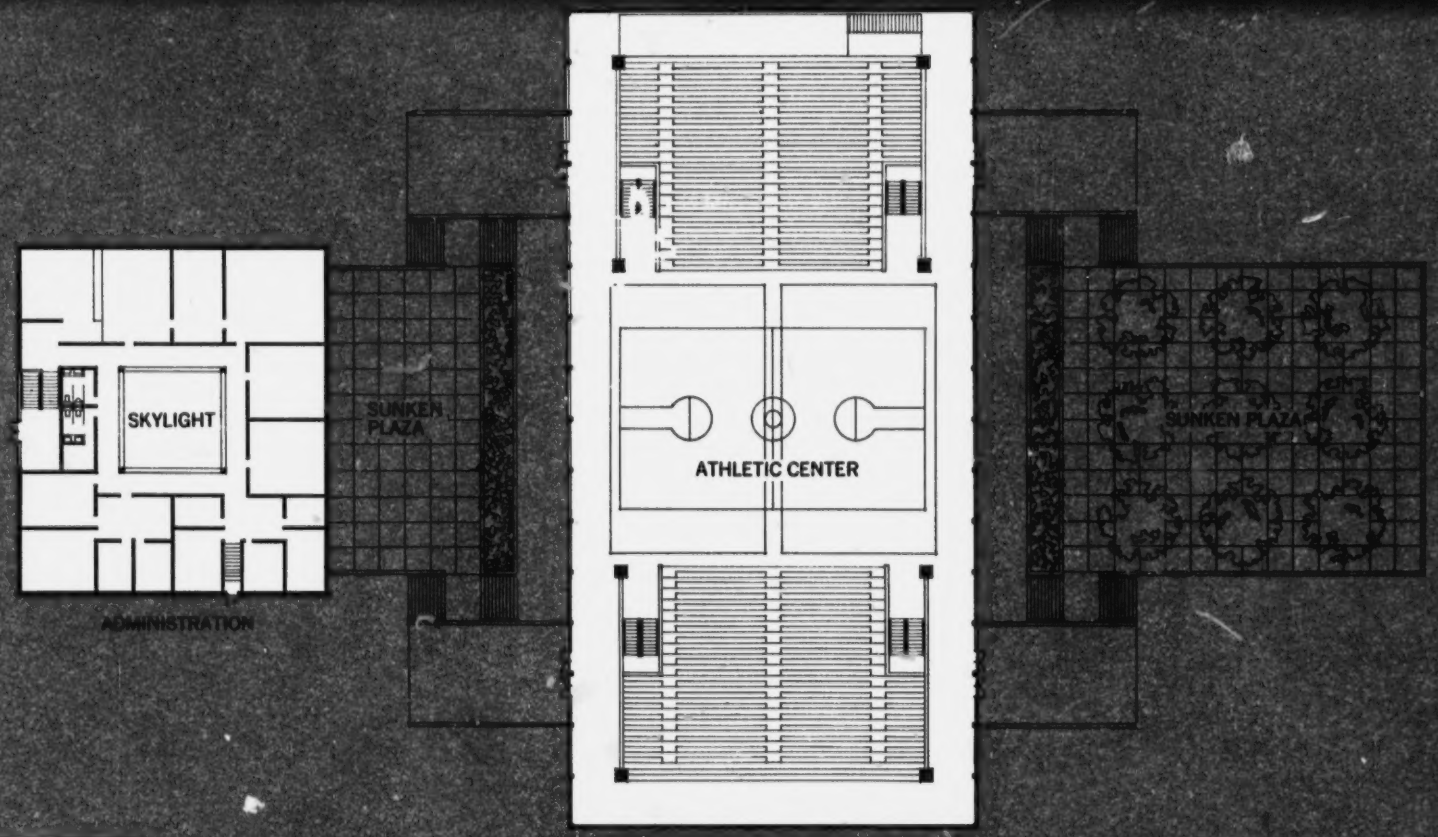
The overall plan proposed by the architect is premised upon a new campus core, with those facilities to be used jointly for educational activities of the school and community emerging as the central focus of the core. Muchow has described his approach as "social" rather than "architectural." The intent, he states, is to "entice people of all ages into the center of the campus." For them, he has designed a new athletic center, a cafeteria, administrative offices and a library-media center within the central court. An attempt has been made to provide a variety of kinds of spaces to explore, through depressed courts and raised areas, a pool of water to sit around, spaces for active recreation and spaces for passive activities. Says Muchow, "This space should not be a static one." The basic court space presently exists but is much too large and lacks interest. Muchow suggests that present space may be undesirable because undue roominess between buildings results in an area so vast that it lacks human scale. A basic purpose, he says, for placing the media center right in the middle of the open space and the athletic center nearer the present buildings is to create a more intimate, and therefore more inviting, exterior space than now exists.

All of the new facilities intended for combined community and school use are compactly positioned for efficient operation and effective supervision. Still, even with their central campus location, all facilities are accessible to the surrounding community. Locker rooms are placed where they can serve the athletic center as well as playing fields and the existing swimming pool. Muchow even suggests that the cafeteria might well serve the neighborhood and business community besides the high school students. He describes his specific building solutions, not as what necessarily ought to be, but as an "indication of where things might occur to achieve an optimum school-community interaction." In this scheme, learning is but one part of that interaction. An attempt has been made to create an exciting environment that would attract the entire community, regardless of age.

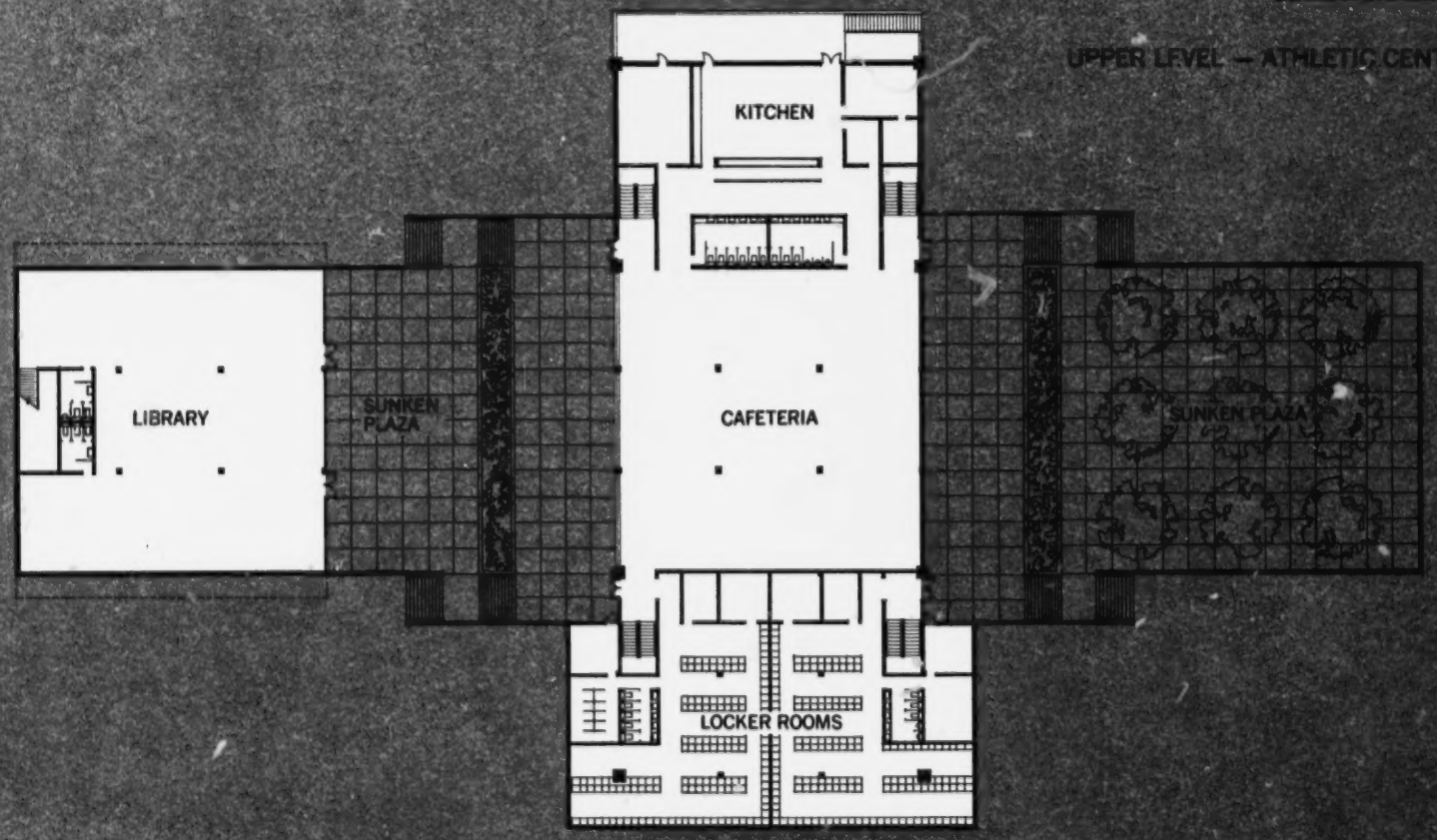
The athletic center and library building were positioned to add definition to a presently scattered arrangement of buildings. He uses the facilities as an integrating mechanism for the existing buildings. The program requirement for improved community service in these new facilities also

SECTION NORTH-SOUTH THROUGH LIBRARY-ADMINISTRATION BUILDING & ATHLETIC CENTER

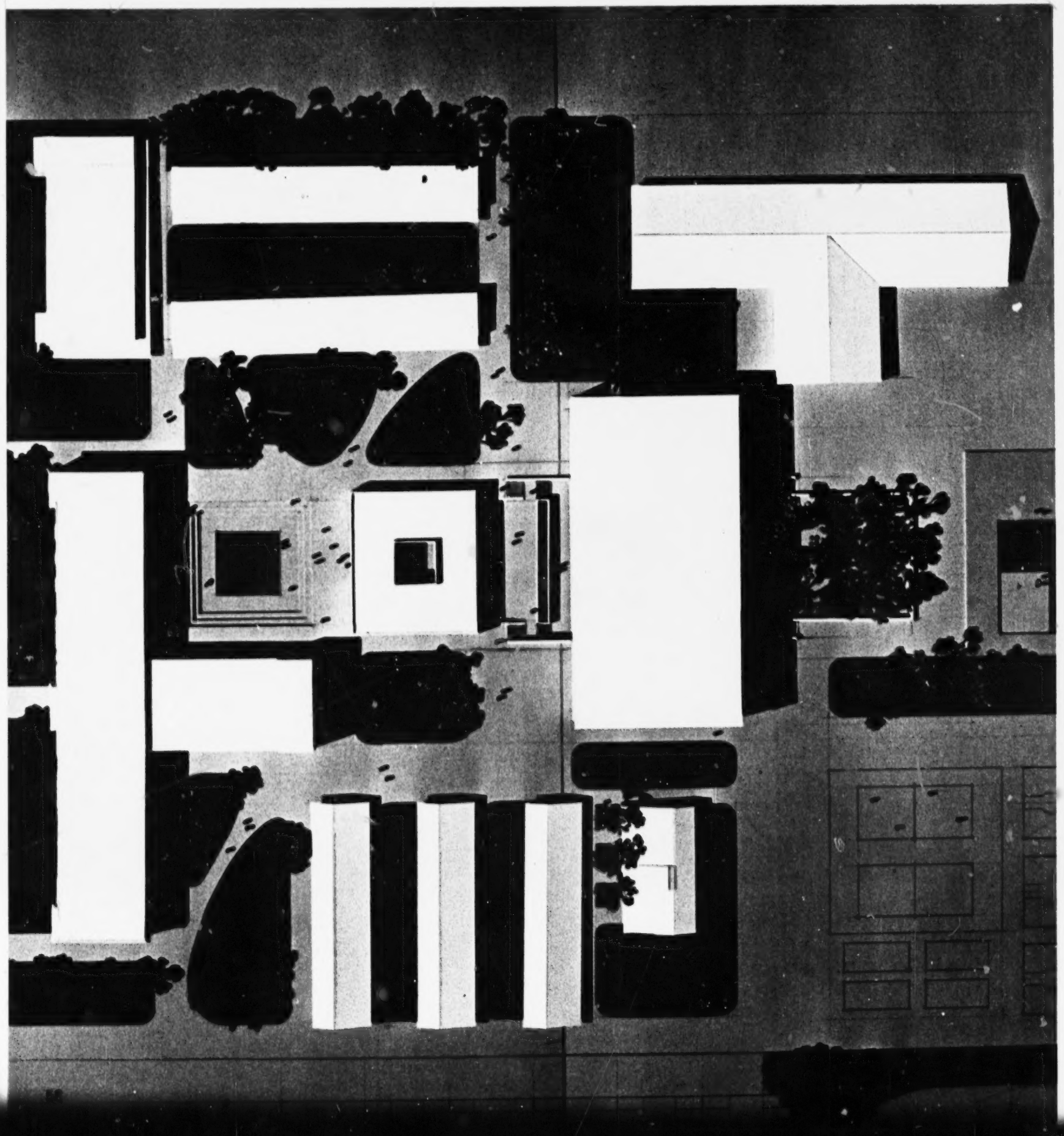




UPPER LEVEL — ATHLETIC CENTER & LIBRARY-ADMINISTRATION BUILDING



LOWER LEVEL — ATHLETIC CENTER & LIBRARY-ADMINISTRATION BUILDING



Site plan

Fallout protection

The new athletic center was designed to include fallout protection for the projected total school enrollment. The shelter space occurs at the lower, depressed plaza level of the athletic center where inherent shielding advantages occur because of below ground location and heavy overhead floor construction. A shelter occupancy of approximately 1,735 persons is possible in the space, which has a protection factor of about 50.

In developing his depressed plaza scheme, the architect stresses that he has not created an unlighted basement space. Through successive depressions, the lower plaza level with its open areas is actually an extension of the modeled site. In opening up this lower plaza level to create a natural extension of the site, Muchow complicated the fallout protection problem. However, the several resulting "weak" points are skillfully corrected. Glass walls of the cafeteria shelter are recessed under the extended platform of the athletic center above, while the deep edge beams of the platform further enhance the protection. At the retaining wall between middle and lower plaza levels, a raised planting box also serves as a railing. Between the protective

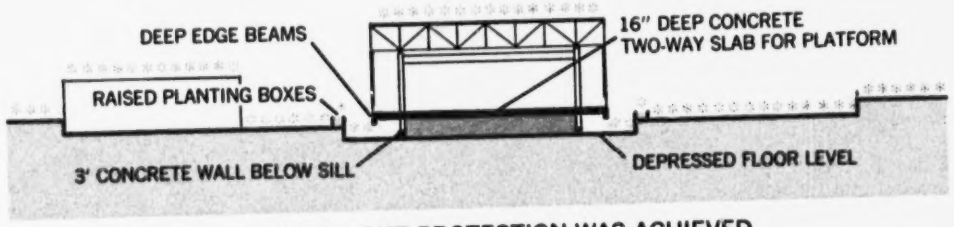
AREA SUMMARY

Existing Schoolhouse	**152,546 sq. ft. total**
1925 Classroom Building	47,512 sq. ft.
Gymnasium	25,685 sq. ft.
Science-Homemaking Building	25,537 sq. ft.
Classroom Wings	18,772 sq. ft.
Shop Building	22,548 sq. ft.
Portable Classrooms	4,800 sq. ft.
Miscellaneous Buildings	7,692 sq. ft.
Proposed Schoolhouse	**177,200 sq. ft. total**
1925 Classroom Building	50,335 sq. ft.
New Athletic Center	45,682 sq. ft.
New Library-Administration Building	14,326 sq. ft.
Science-Homemaking Building	25,537 sq. ft.
Classroom Wings	18,772 sq. ft.
Shop Building	22,548 sq. ft.
Construction Removed	**38,742 sq. ft. total**
New Construction	**62,591 sq. ft. total**

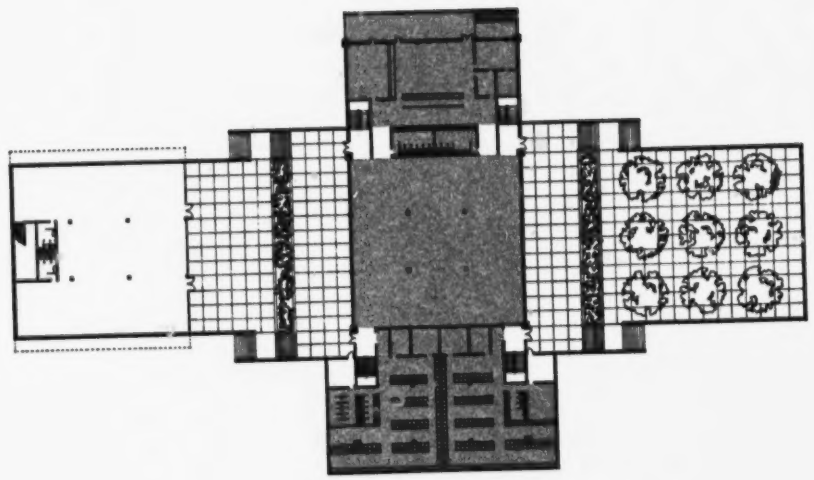
shell concept of the athletic center floor and the planting box railing, nearly all skyshine radiation contribution is eliminated in the shelter space. Radiation exposure from the lower plaza level strips between the building and the side retaining walls is reduced by three-foot concrete walls below the window sills.

This inherently good shelter location gains added shielding benefits from its placement under the floor of the athletic center. As the architect explains, the light roof framing of the physical education facility offers little shielding benefit, and it would be costly to increase the mass of the long-span roof; whereas the solid construction needed for the playing floor offers acceptable radiation shielding without increased slab thickness. Thus, the fallout protection is achieved without any directly attributable costs.

Should the shelter ever be needed, its occupants would benefit from several other features of its location, including the kitchen with food preparation facilities, shower rooms and large restroom areas. They also would have the benefit of natural lighting without excessive radiation exposure.



HOW FALLOUT PROTECTION WAS ACHIEVED



LOWER LEVEL PLAN OF ATHLETIC CENTER SHOWING FALLOUT PROTECTED AREA

ESTIMATED CONSTRUCTION COSTS

Demolition of Gymnasium	$ 57,791.00	
Remodeling of 1925 Classroom Building	225,096.00	
New Library-Administration Building	231,678.00	$14.33/sq. ft.
New Athletic Center	652,079.00	14.27/sq. ft.
Additional Cost for Fallout Protection in Athletic Center	5,381.00	
Total Estimated Construction Costs	**$1,172,025.00**	

About the architect

ROBERT A. KEAR, young and imaginative, presently is staff designer with the Philadelphia firm of VINCENT G. KLING, and ASSOCIATES, whom he represented in this study. Since 1960, Kear has been with the Kling firm, where his experience has covered a broad range of projects from educational facilities to commercial and industrial buildings. A graduate of Pennsylvania State University, he later took a Master's degree from the University of Oregon. Kear brought to this design-in the organizational know-how and powerful design philosophy gained through association with a nationally prominent, large and accomplished firm. One of Kear's designs recently was recognized by the AIA. The Sharples Dining Hall for Swarthmore College received an AIA Award of Merit and a Gold Medal by the National Academy of Design.

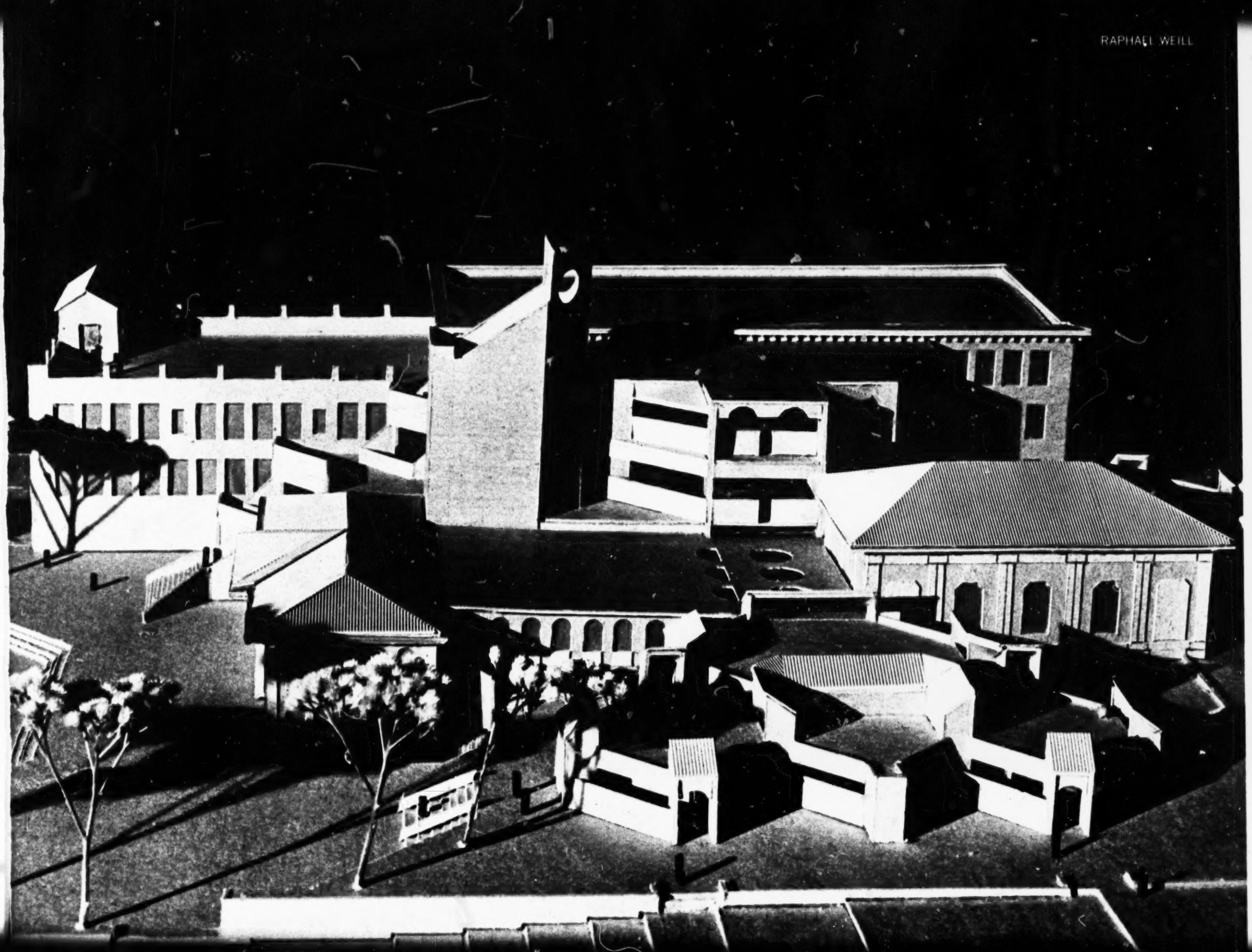
Project Educational Consultants: San Francisco Unified School District
Lucille Baker, Principal, Hawthorne Elementary School
Philip Cali, Supervisor, Buildings and Grounds
Gerald Foley, Media Specialist
Rose Marracinni, Principal, Commodore Sloat Elementary School
Isadore Pivnick, Coordinator, Federal-State Projects
Victor Rossi, Supervisor, Compensatory Education
Herb Simon, Director of Art
Wilbert G. Vestnys, Assistant Superintendent for Buildings and Grounds

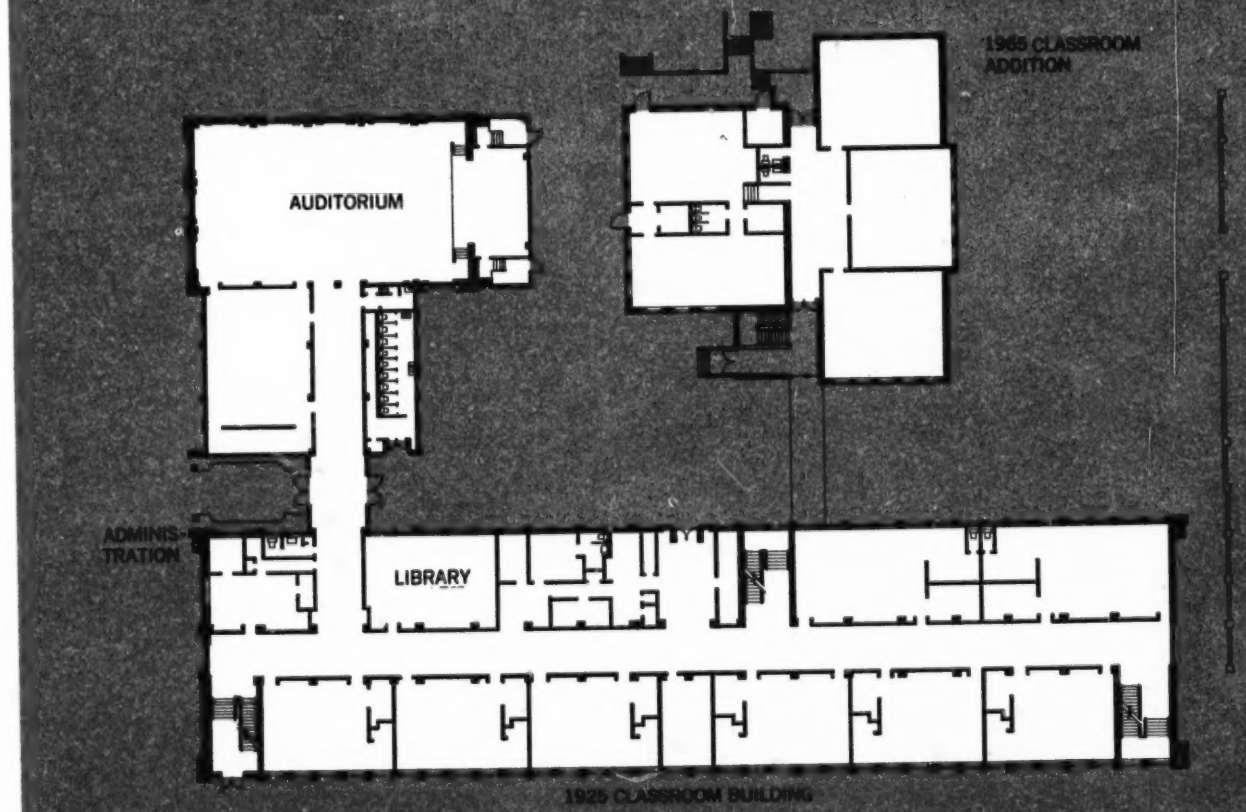
Student Design Team:
William Adams
Wayne Belka
Charles Harker
Paul Walton
Gene Yergensen

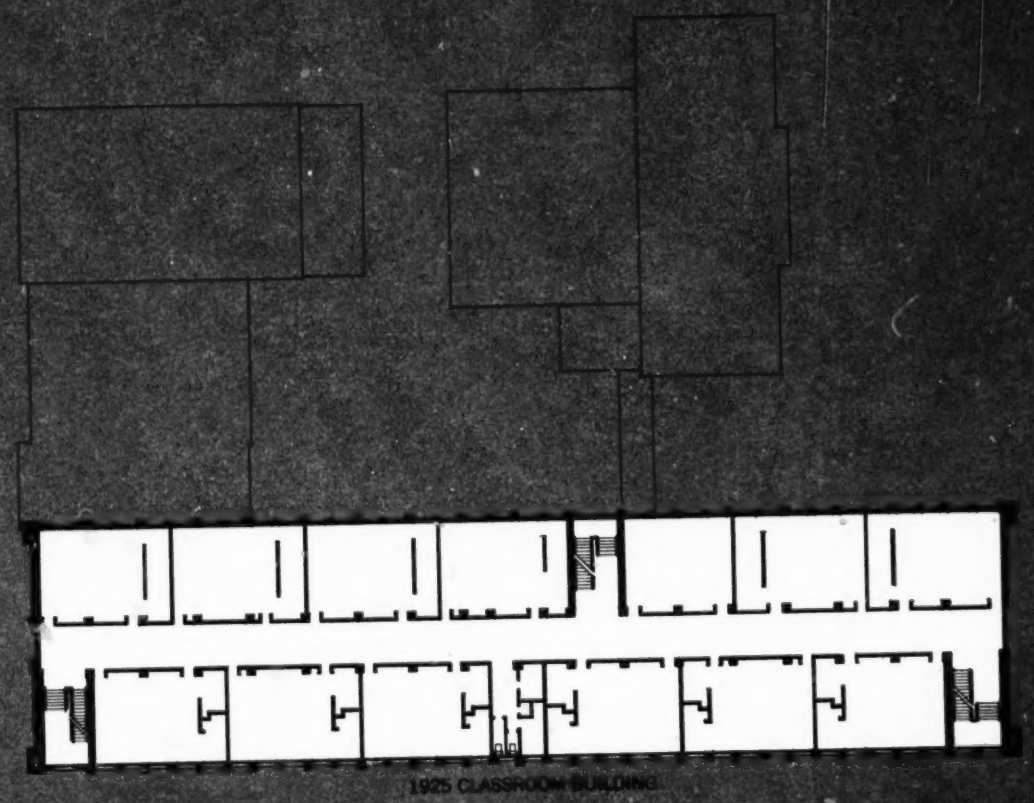
RAPHAEL WEILL ELEMENTARY SCHOOL San Francisco Unified School District San Francisco, California

Front (north) facade

RAPHAEL WEILL

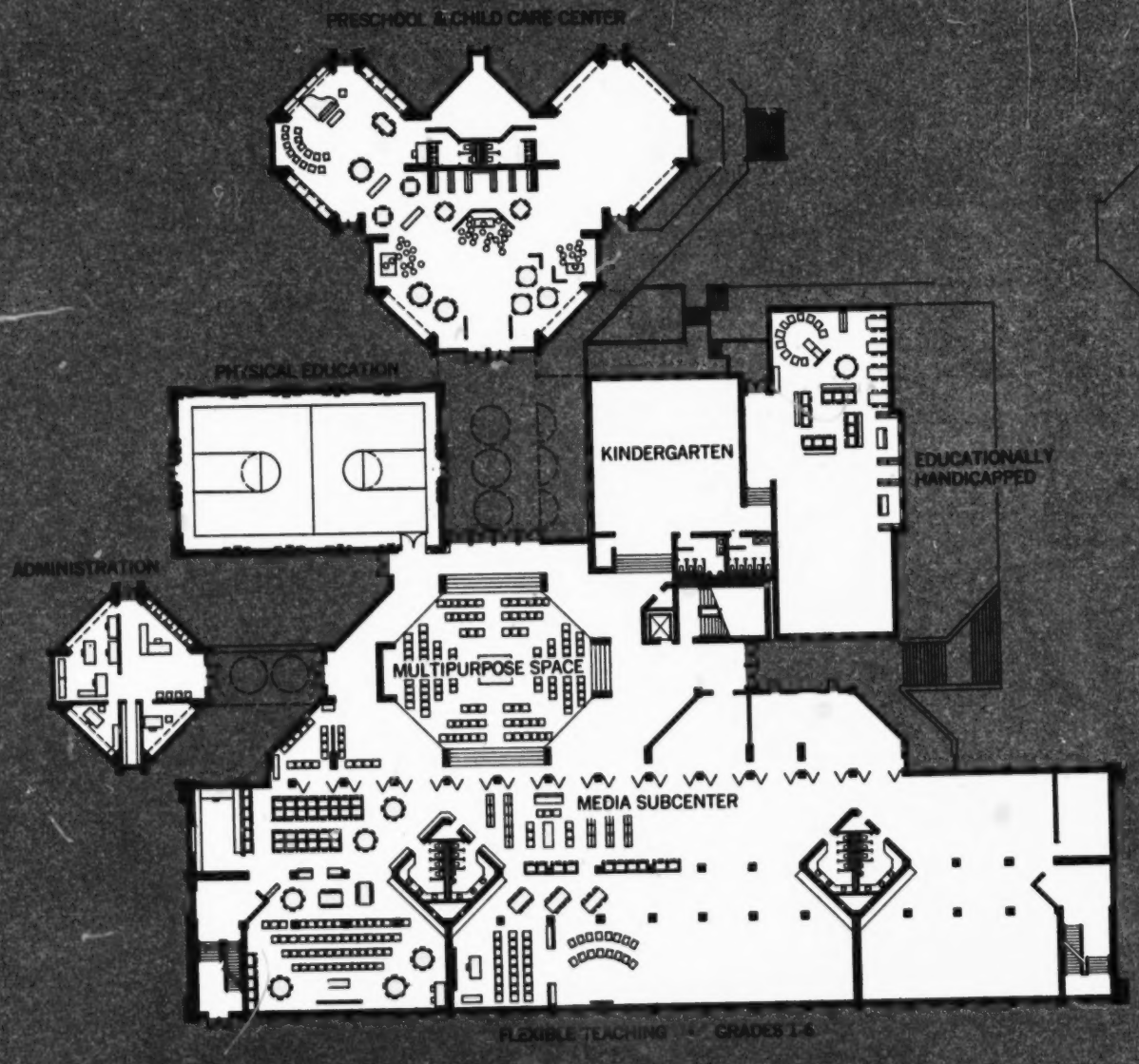




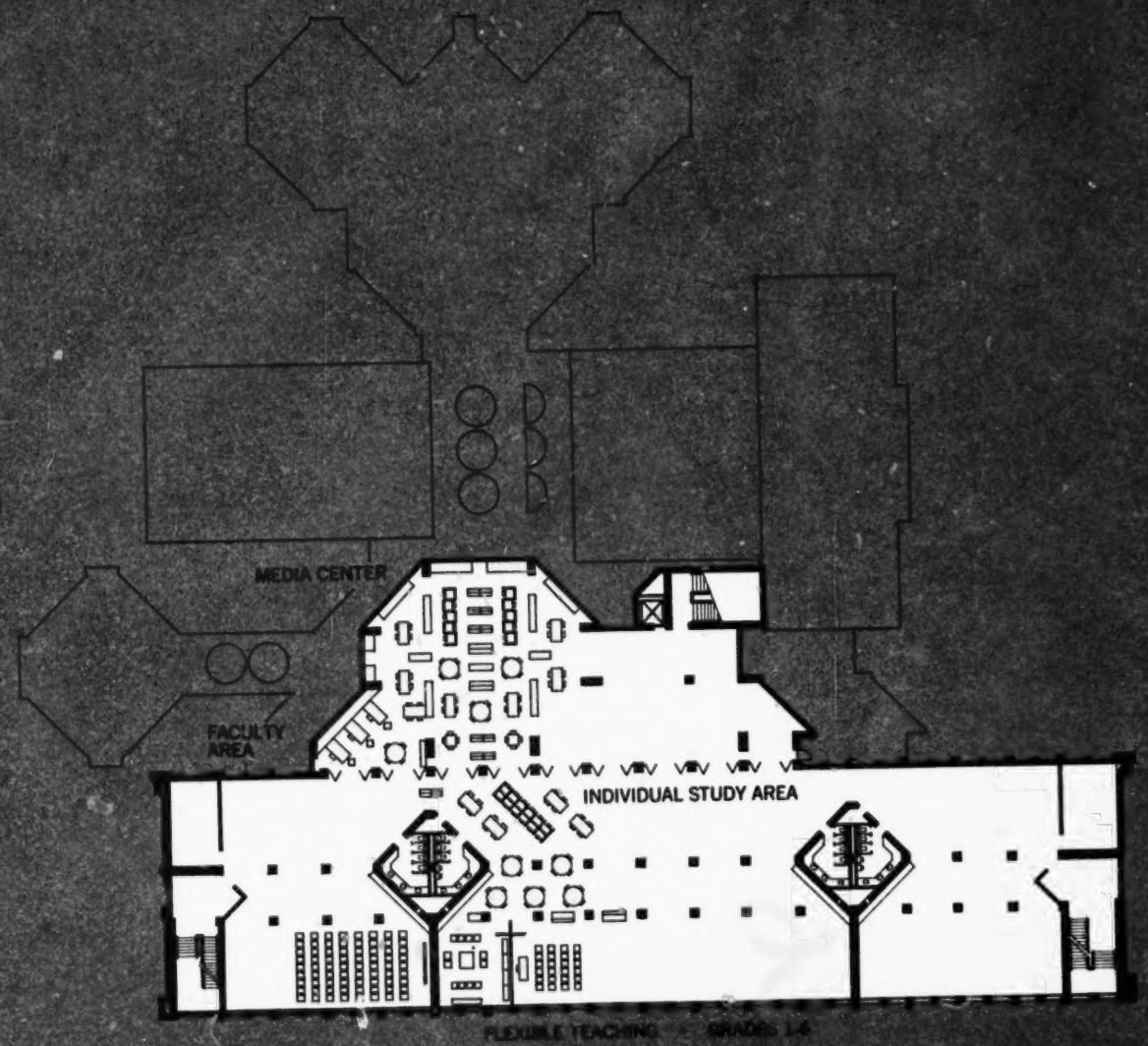


NORTH

Existing schoolhouse



FIRST FLOOR



SECOND FLOOR

NORTH

Proposed schoolhouse

Existing schoolhouse

1965 CLASSROOM ADDITION

DRESSING ROOMS

MECHANICAL EQUIPMENT

1925 CLASSROOM BUILDING

GROUND FLOOR

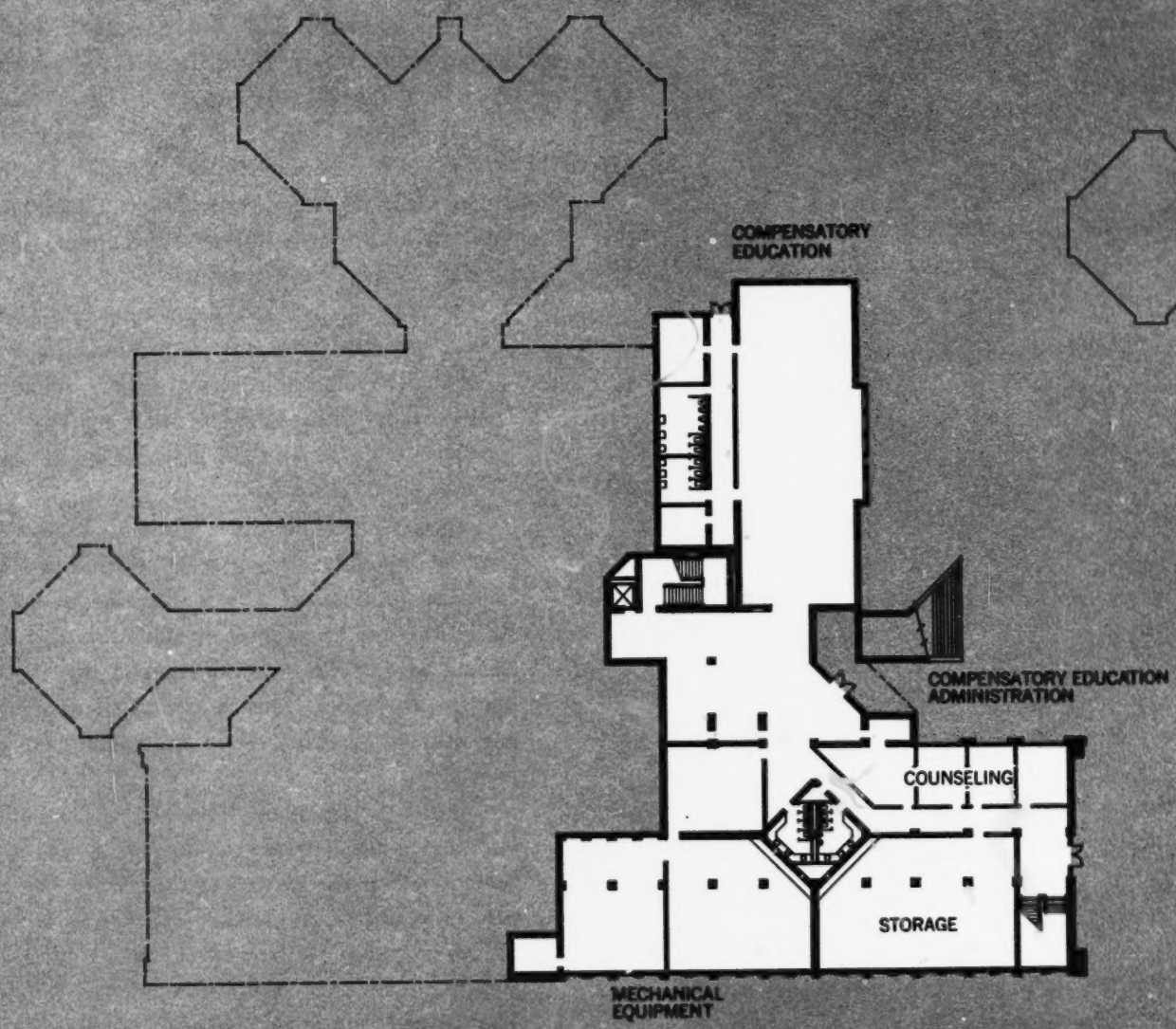
ROOF DECK

1925 CLASSROOM BUILDING

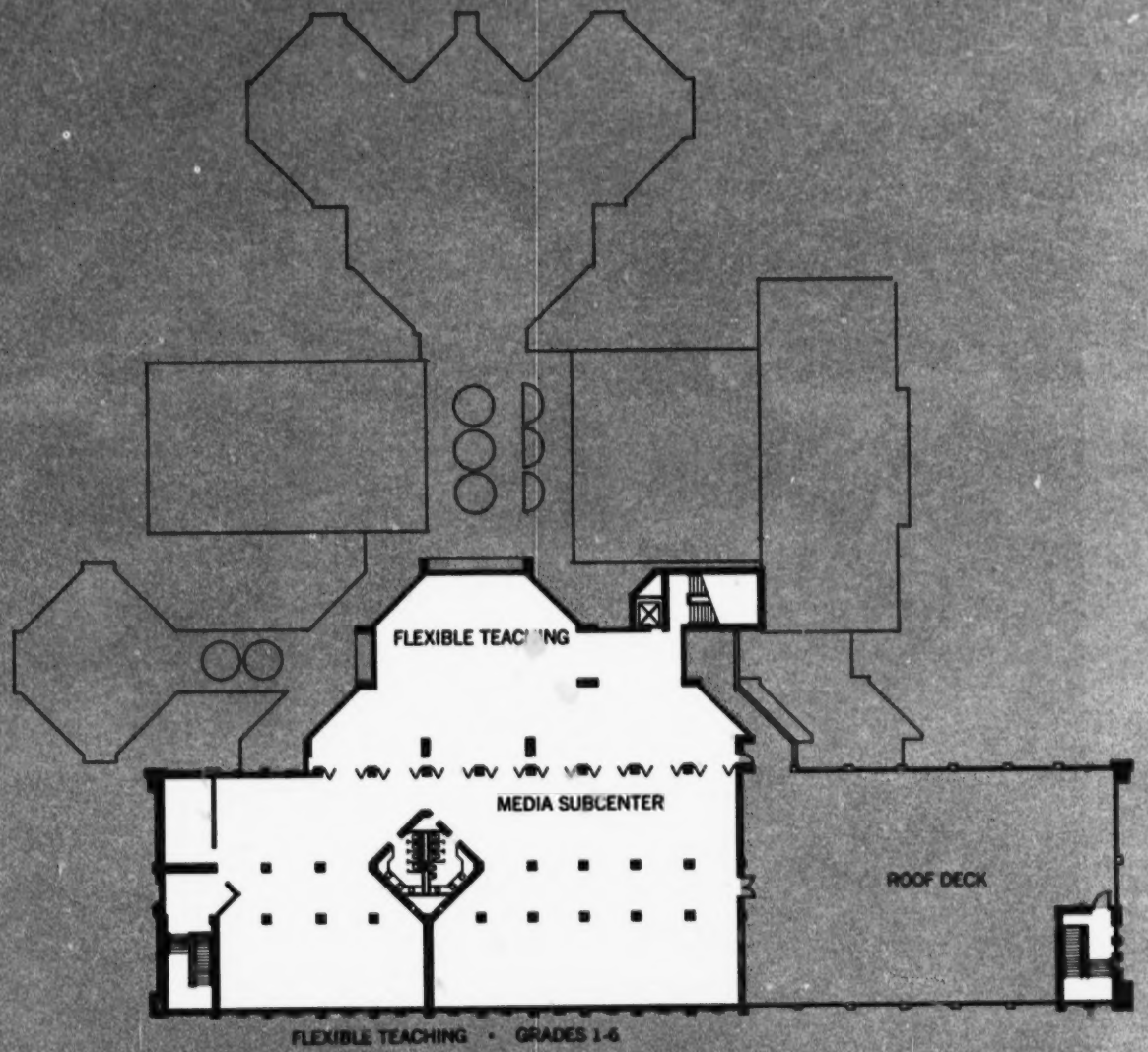
THIRD FLOOR

NORTH

Proposed schoolhouse

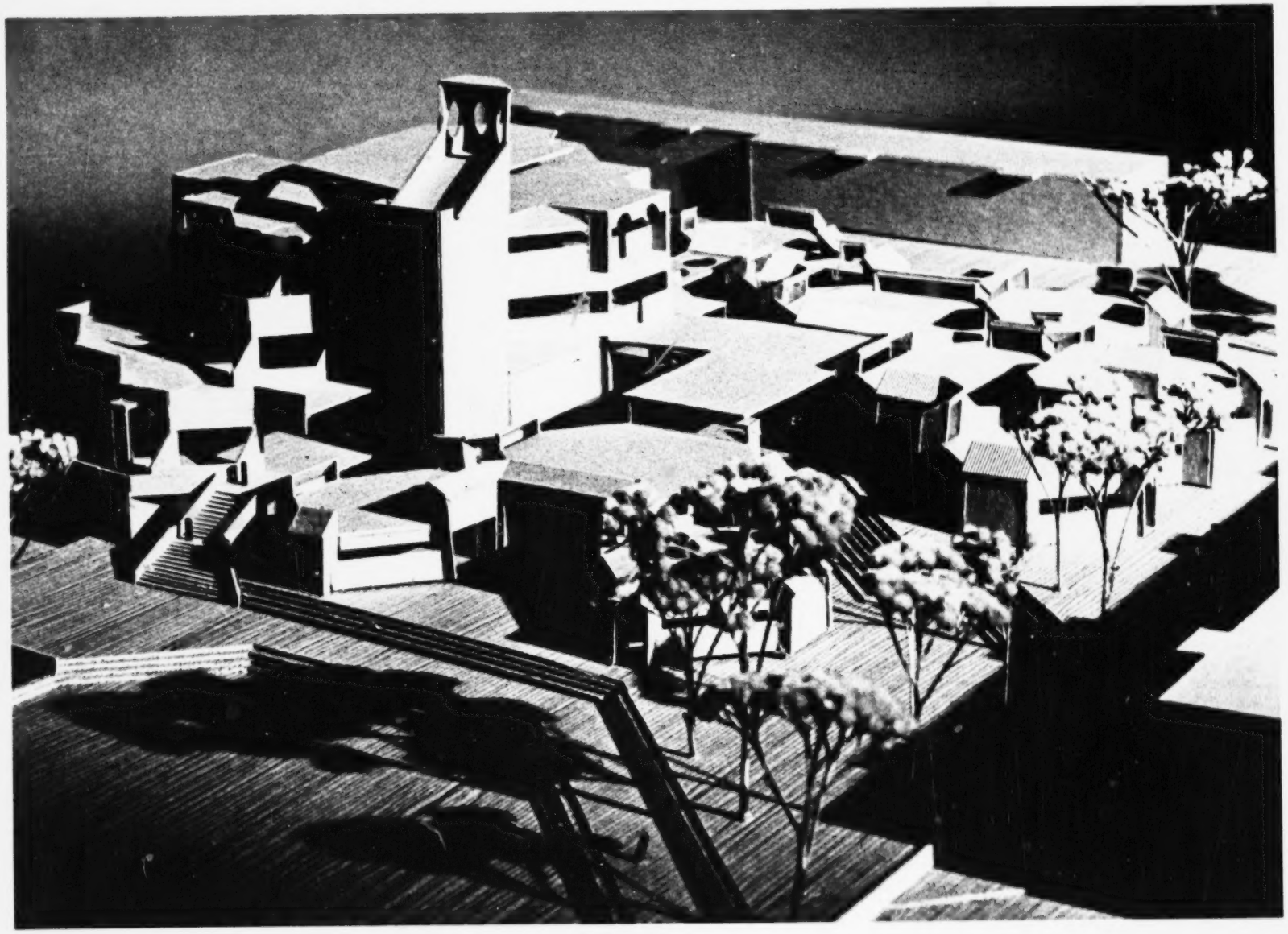


GROUND FLOOR



THIRD FLOOR

NORTH



About the project

This K-6 elementary school is sited in the central city of San Francisco, just a few blocks north and west of the civic center. It is one of more than 50% of the schoolhouses in the San Francisco Unified School District seriously affected by recent State legislation requiring structural upgrading of pre-1933 buildings deemed unsafe under seismic loading situations. To satisfy this legislative requirement, Raphael Weill Elementary School needs structural modification of its concrete frame primarily in improved lateral resistance. The District faces the need for modifying the plant in the near future. This situation has provided an opportunity for examination of the educational aptness of the entire facility.

Dr. Robert E. Jenkins, Superintendent of the San Francisco Unified School District, has recently set in writing two principles which identify educational concepts to be adapted throughout the District in new construction:

1. The individualization of teaching and learning is more vital than ever as a motivating force to help each child grow to his maximum.
2. Flexibility is essential in order that we may cope with and take advantage of rapid change.

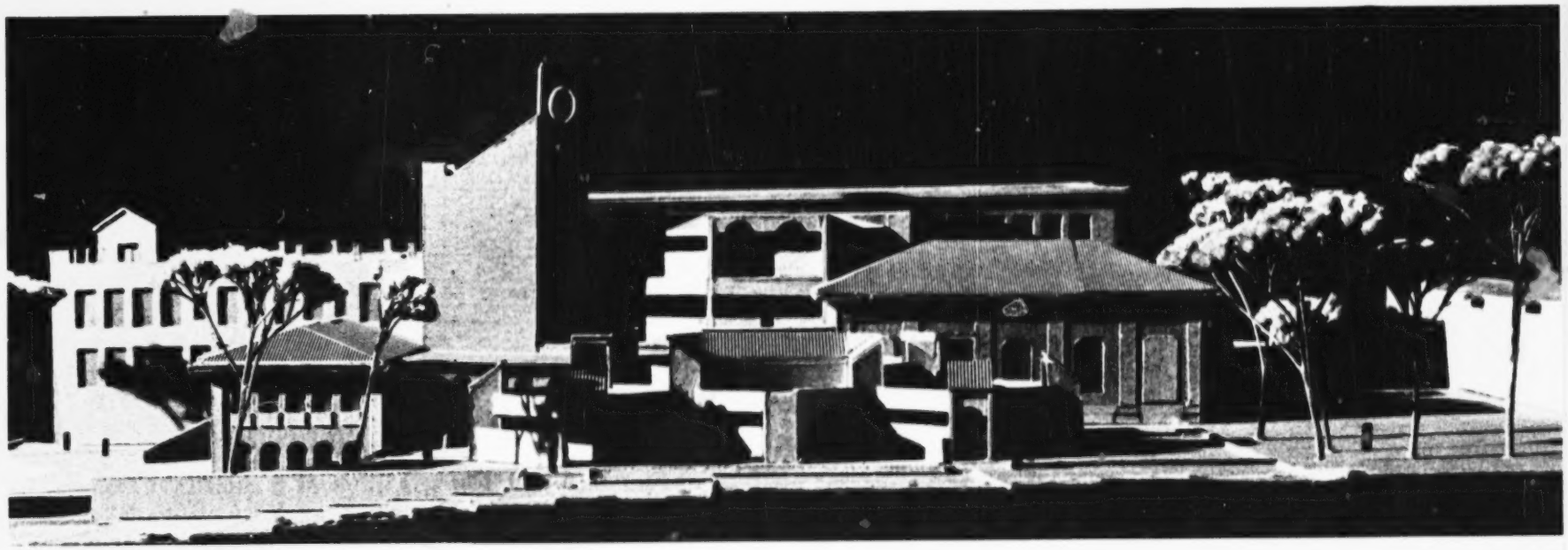
These principles are equally pertinent to existing schoolhouses where opportunities occur for their application. The implication in extensive structural modifications needed for the Weill School suggests their application in this instance because the school fails to permit these preferred educational experiences in its present arrangement.

The existing plant consists of an original building of three stories on the north with a basement exposed on the south side of the sloping site, an attached auditorium which was a part of the original 1925 construction, and a free-standing classroom addition completed in 1965. The 1925 building plan is a center, double-loaded corridor arrangement serving 28 self-contained classrooms. Typical of many older schools, administrative offices, the library and other service spaces are tucked into classroom space along

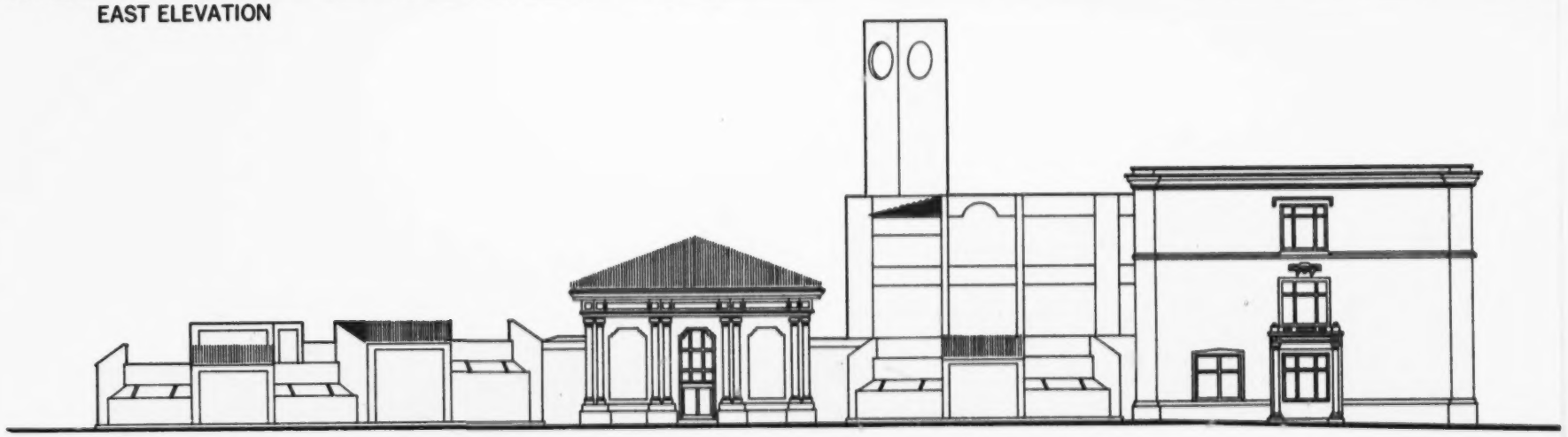
these corridors. The 1965 classroom addition, also of reinforced concrete construction, houses kindergarten, preschool programs and a child care center serving the surrounding neighborhood.

The Weill School is typical of numerous urban schoolhouses in San Francisco and elsewhere. It was constructed in an earlier era to serve educational philosophies of that era. While attention was given in this study to the potentials and possibilities for creating a new, more flexible and, therefore, more efficient educational environment in the Weill School, application of the ideas to a number of similar buildings cannot be overlooked.

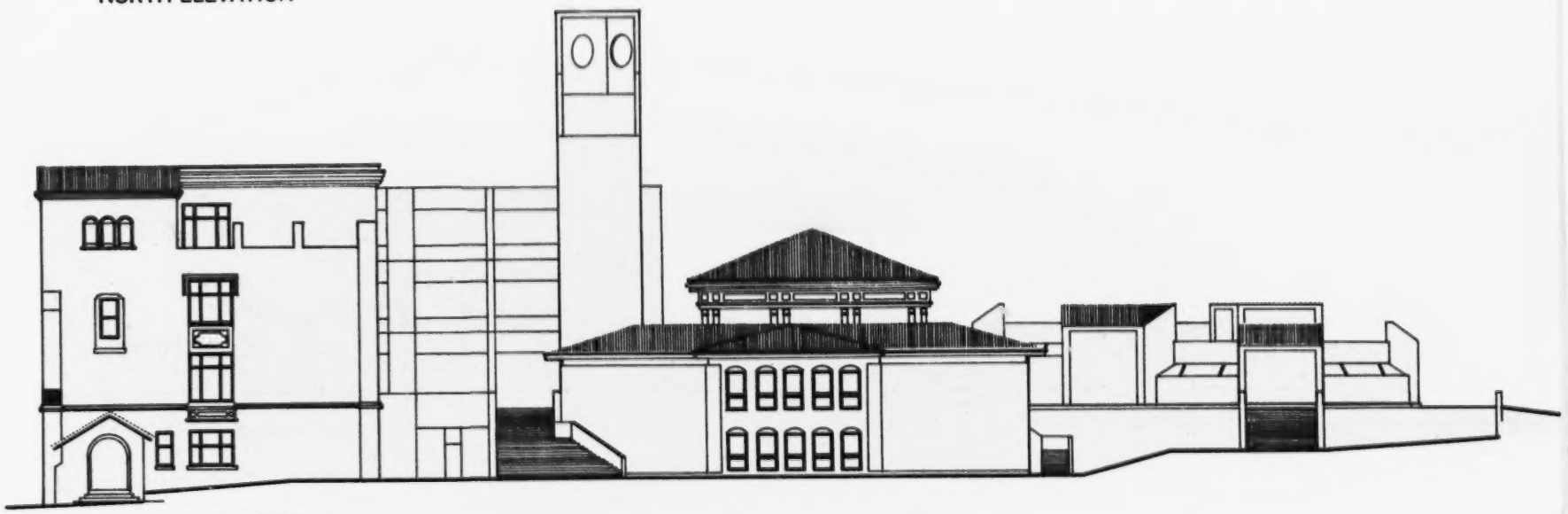
However, the problems faced by this design team are only partly identified in the traditional and educationally limiting space arrangements of the Weill School. Placed on a small site of about four acres, the school is situated in the midst of an urban renewal area, with new row housing completed on two sides and site demolition in progress on a third side. Raphael Weill Elementary School's situation as the focus of this revitalized neighborhood carries an educational responsibility to serve more than K-6 students. Recognition of broader neighborhood responsibility for schools is gaining increased acceptance among educators. Schools properly planned and operated with this extended service in mind can, in addition to traditional educational functions, carry out an array of educational, social, and recreational functions for a neighborhood. Administrators of the San Francisco Unified School District are cognizant of this concept of extended community-oriented services emanating from the school system and are pursuing plans to accomplish this throughout the District. In its revitalized neighborhood, the Weill School is uniquely situated to offer many of these community-oriented services to an area much in need of them. The neighborhood is made up of an aglomeration of ethnic groups. Not all live in the new row housing. The neighborhood served by the school includes numerous old dwellings, some of which are substandard and occupied



EAST ELEVATION



NORTH ELEVATION



SOUTH ELEVATION

by low-income families. It is important, however, to recognize that the neighborhood now is realizing a new vitality that can be complemented with educationally-oriented services. Hence, the future emphasis of the Weill School, its programs and its facilities, must be directed to fill this void.

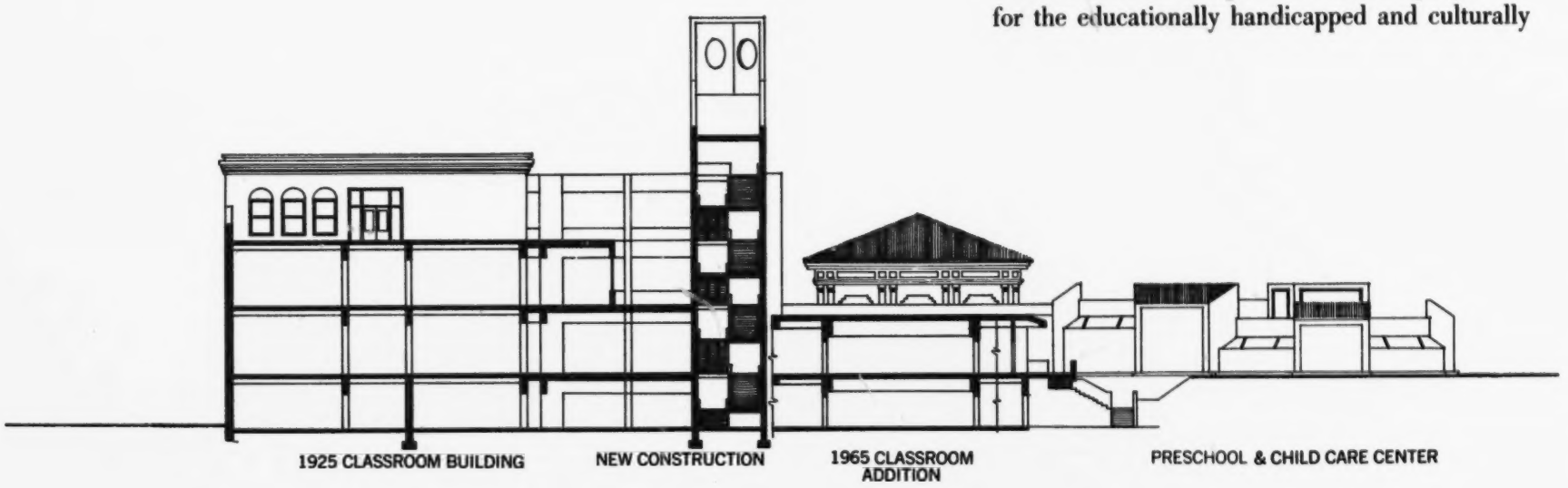
The future Weill Elementary School therefore requires facilities both for the K-6 program and for community-oriented services that can best be provided through the school program. School needs include greater flexibility of teaching areas, a new library, administrative space, teacher preparation and work space, individual study areas, and a multiuse space which can also serve for community-oriented activities. Facilities also are needed for special education programs for the educationally handicapped and culturally deprived, which will be a part of the new program.

The present K-6 enrollment of 750 pupils will remain about the same, but the school will require additional facilities for the community-oriented programs. An optimum student capacity of about 950 is planned.

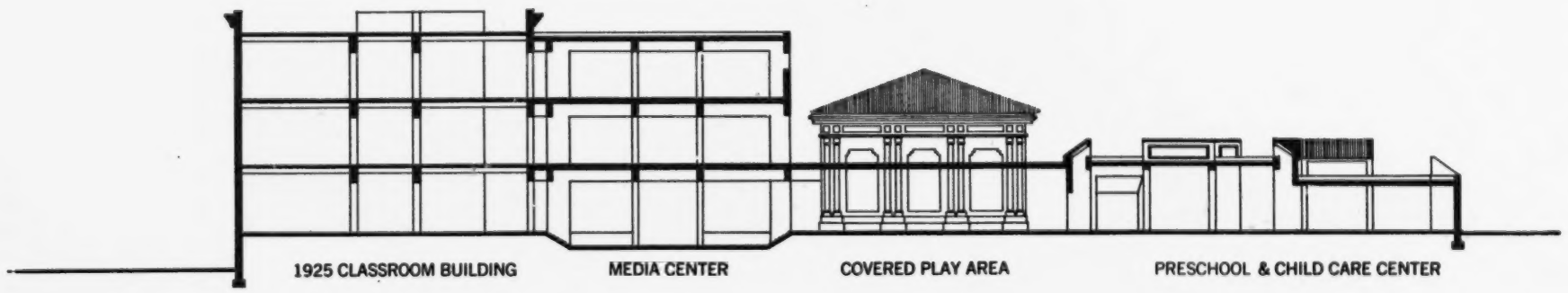
Kear's proposal for the Weill Elementary School is bold and far-sighted, as befits its position as a focus of the neighborhood. Constrained by numerous, undesirable existing conditions, not the least of which were the small site and the badly placed 1965 classroom addition, the design team has achieved a unification of old and new facilities which elevates the schoolhouse to a landmark in the neighborhood. This is achieved simultaneously by increased flexibility of existing space and by the functions as set out in the program.

In an expression of concern regarding the validity of costly, extensive, and compromised renovations of an inadequate existing facility, Kear has gone beyond the program requirements by developing a scheme which allows eventual replacement of the old buildings. New construction, integrated with existing, is designed to permit incremental change, with the ultimate phase completely removing the present plant. Not only is the educational environment improved in the ultimate scheme, but the school's importance in the neighborhood also is strengthened. Still, should the ultimate scheme never be realized, the school's function and appearance at any intermediate phase remains unimpaired.

Kear's approach to design is seen in his analysis of the existing plant and the new facilities suggested by the program. Condensing extensive analysis, Kear describes the problem and points to a solution in brief phrases. "Start at the heart," he says. Accordingly, Kear proceeded to "build those facilities that generate the concept of education — a center from which everything radiates." The essence of this concept is evident in the proposal which shows the multiuse space and the media center as the focus of the new schoolhouse.

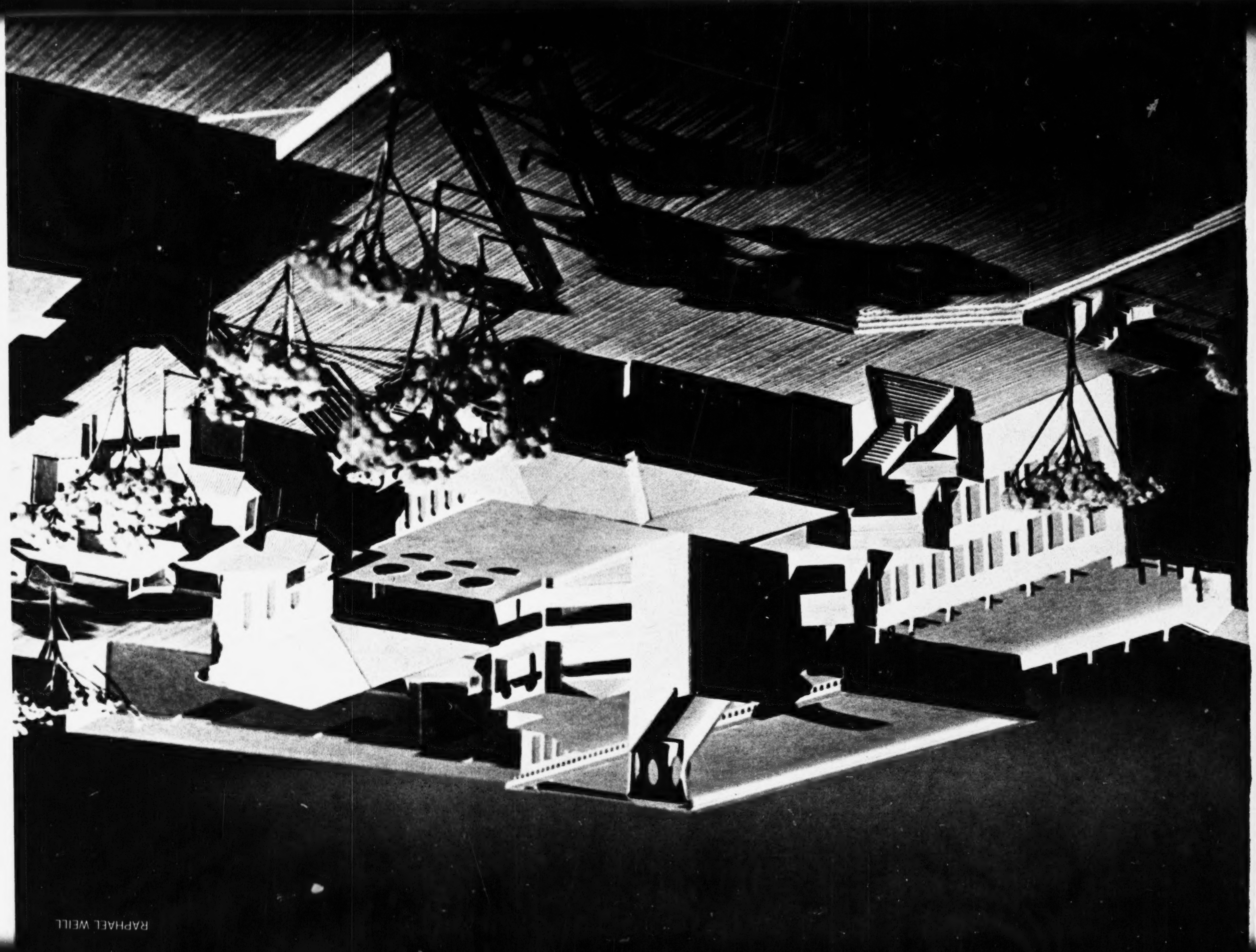


SECTION EAST-WEST THROUGH 1925 CLASSROOM BUILDING & 1966 CLASSROOM ADDITION.



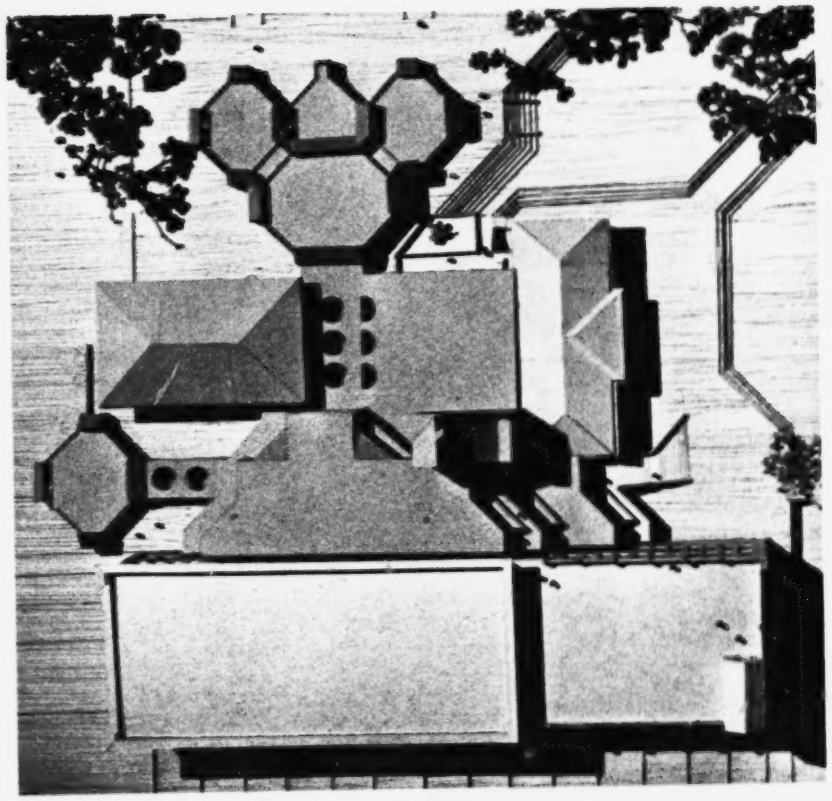
SECTION EAST-WEST THROUGH 1925 CLASSROOM BUILDING, MEDIA CENTER, & PRESCHOOL & CHILD CARE CENTER.

View from southeast

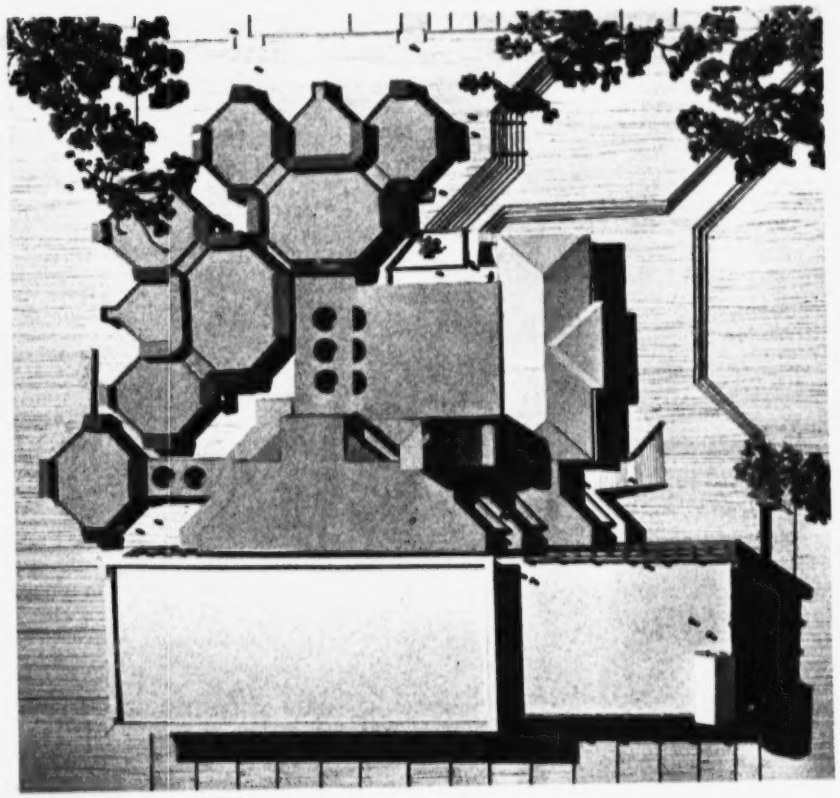


RAPHAEL WEILL

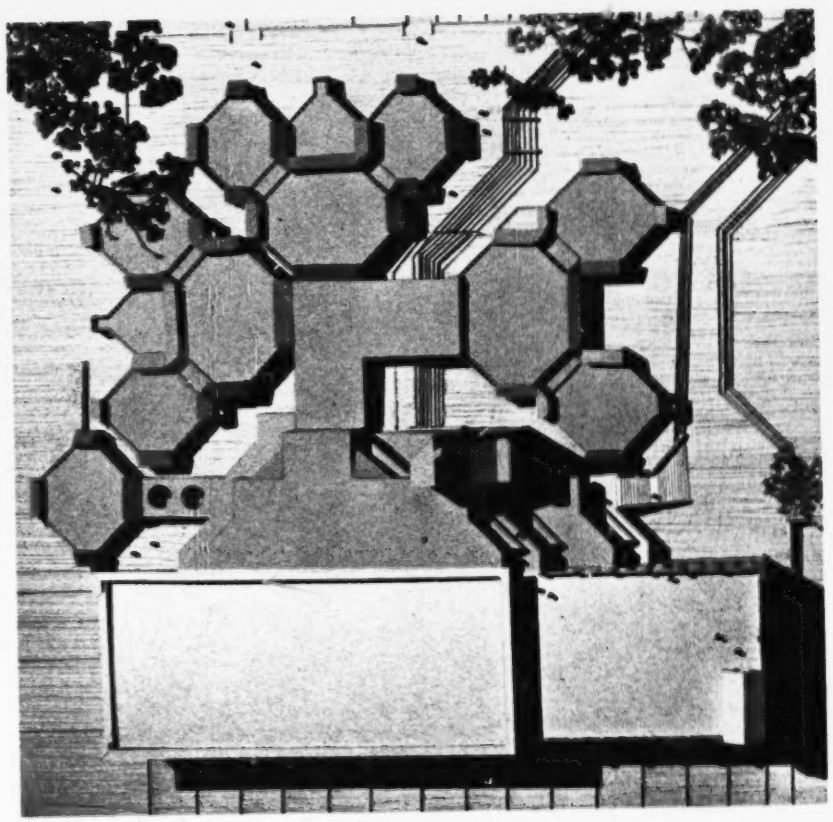
Proposed construction phasing with ultimate replacement of the existing schoolhouse



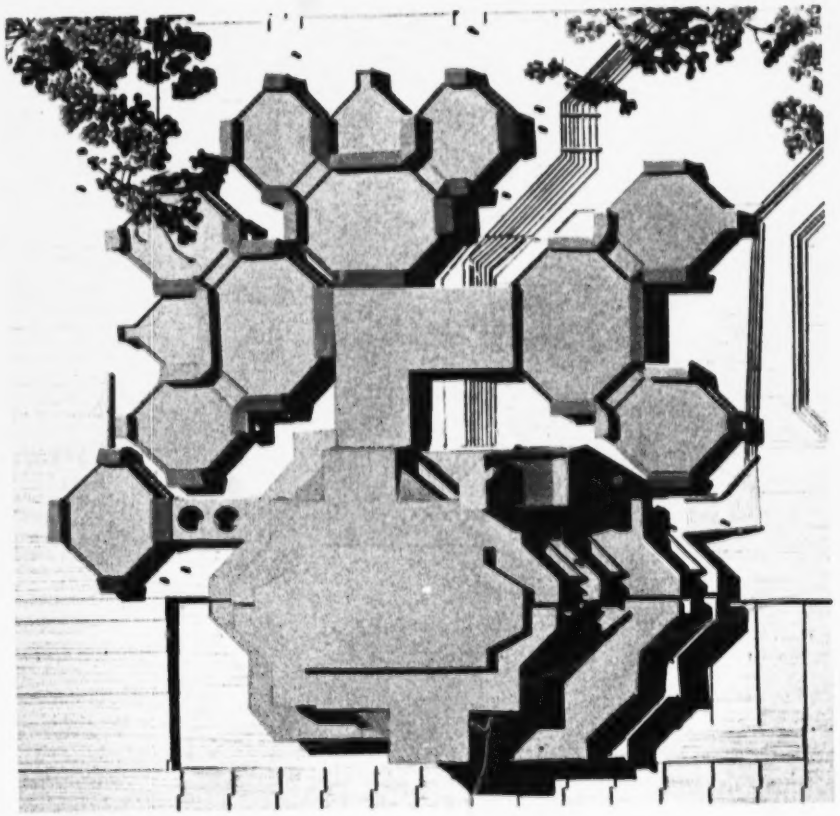
Phase 1



Phase 2



Phase 3



Phase 4

Kear identified four essential considerations in his scheme for the school, whose present plant he describes as the "social stigma" of the neighborhood: (1) the three-story building of self-contained classrooms is unworkable for the individual student's learning environment; (2) space needs for community and preschool functions exceed that area required for the K-6 program; (3) the present total plant area exceeds that required for the K-6 program, and (4) the media center and little theater, both designed to serve for school and community use, and a cafeteria are essential to the new schoolhouse.

In a strongly zoned scheme, Kear placed K-6 educational functions in the existing three-story classroom building whose interiors at each floor level have been completely stripped. He put administrative offices for the K-6 program in a new unit to the north, community and preschool functions in new facilities to the east. Special education programs are placed to the south in the 1965 classroom addition which has undergone extensive alteration. The centrally positioned multiuse space, cafeteria, and media center thus become common to all users.

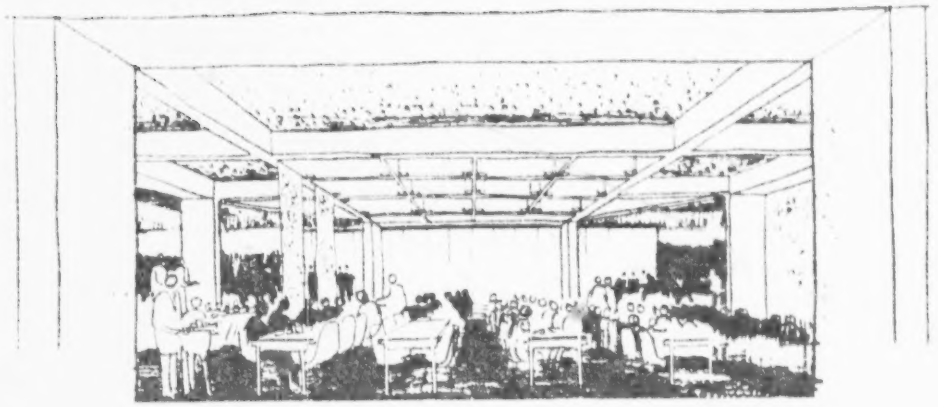
The architect's suggestions for completely flexible teaching space for the K-6 program and consequent gutting of the present classroom building of all fixed-wall constraints are derived from his concept of the "individual as the basis of knowledge." Says Kear: "One-hundred persons in a space look and listen; ten to twelve might discuss, argue or clarify; three or four might even work together as teams; the individual learns." Accordingly, the proposed flexible teaching-learning space allows for groups of all sizes and provides individual study areas in close proximity to the media sources and to faculty work areas. Space separation is achieved by means of movable panels and furniture.

Structural inadequacy of the 1925 building, essentially a need for lateral resistance to seismic loads, is corrected by two new core spaces. Extending continuously through all floors of the building, the walls of these core spaces give the needed shear resistance in all directions. The cores are sized to serve as restrooms and equipment chases. Thus, new plumbing and mechanical systems for the building can be installed without additional demolition of existing concrete slabs.

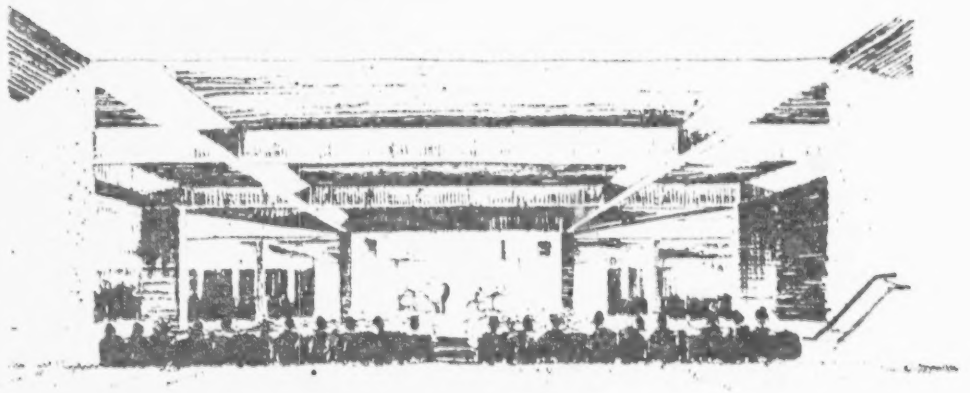
The architect maintains the centric basis of his scheme by placing the media center at the second, or middle, level, although he acknowledges this as a compromise brought about by the multilevel building. This location at the second level is as convenient to all teaching areas as circumstances permit. Media subcenters are then provided to serve the other floors. Programmed materials on carts are suggested by the designers for dispatch to these media subcenters.

The present auditorium, a pleasant appendage to the existing classroom building but inflexible in use except for fixed-seating programs, is retained but converted to indoor activity space. Its position relative to teaching areas and to the neighborhood permits its use by both. Facing a broad, landscaped walkway, once a street but abandoned and planted under the urban renewal program, the building is ideally suited to its new use.

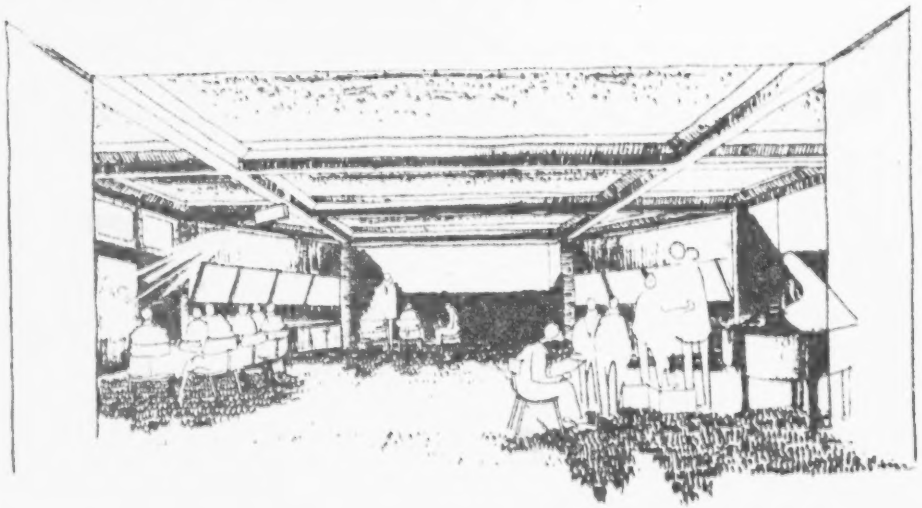
Kindergartens and special education facilities are housed in the 1965 classroom addition. Restrictive self-contained classrooms have been replaced with more flexible teaching stations through considerable alteration of this building. Preschool facilities and a child care center are placed in a new unit further to the east. Both are readily accessibly to the new row housing areas and can be used without noise or circulation interference with the K-6 program.



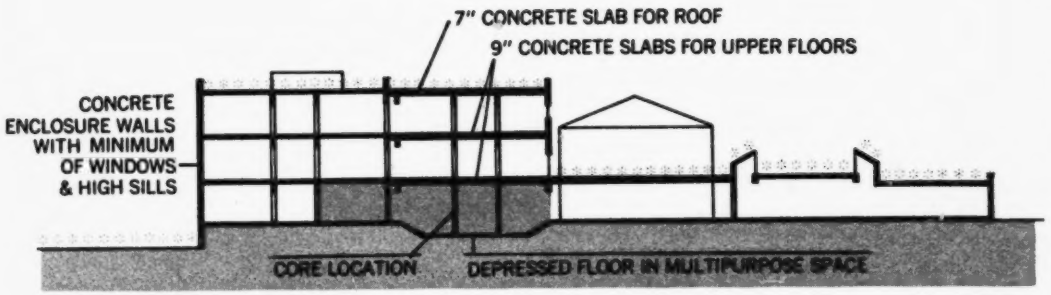
MULTIPURPOSE SPACE USED FOR CAFETERIA DINING



MULTIPURPOSE SPACE USED AS A PLATFORM STAGE



FLEXIBLE TEACHING IN PROPOSED THIRD FLOOR ADDITION



HOW FALLOUT PROTECTION WAS ACHIEVED

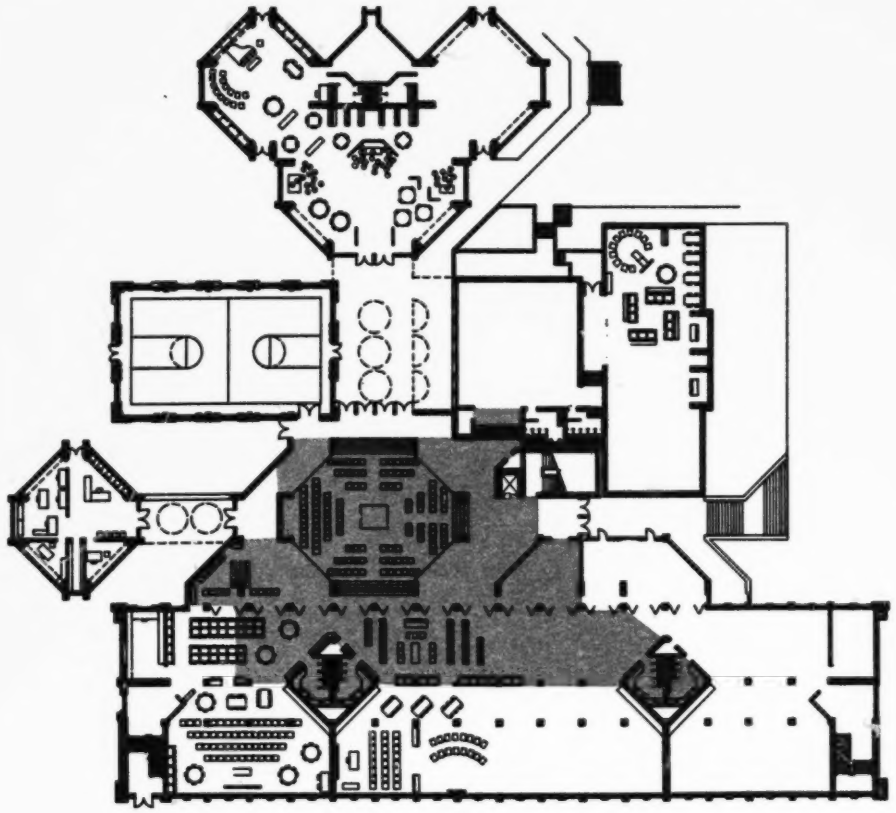
Fallout protection

Two separate areas of the redesigned Weill Elementary School provide fallout protection. Their combined occupancy of 1,355 persons exceeds the anticipated daily occupancy of the school. According to the architect, fallout protection was achieved in his design solution without functional or construction adjustments in his basic scheme. The inherent shelter which he provides results entirely from design and construction features, both existing and new, which occur in the educational rehabilitation.

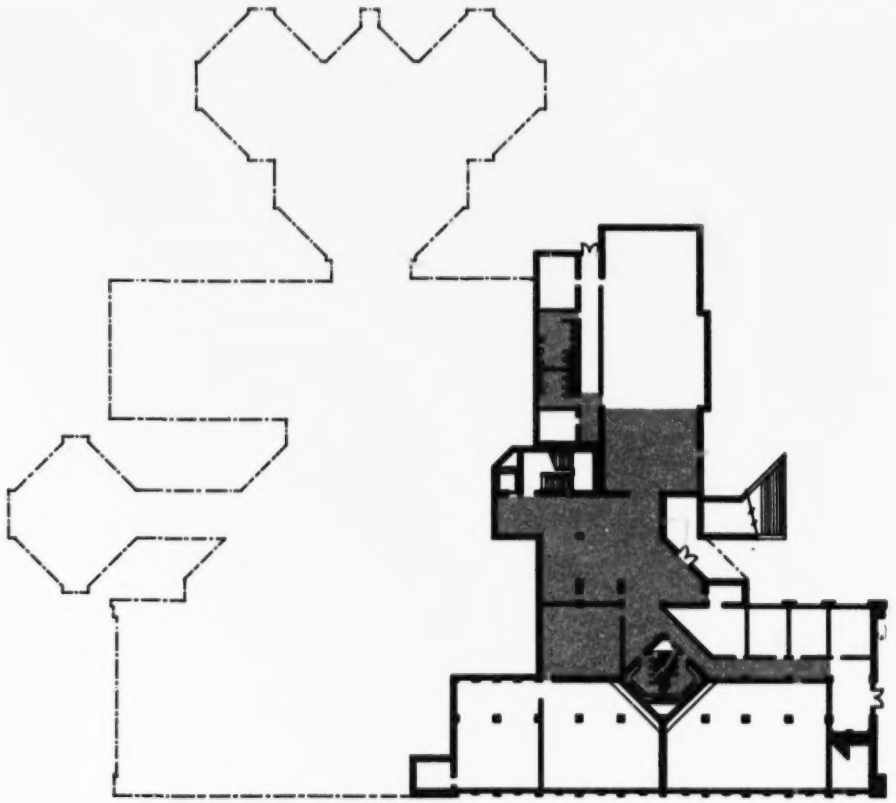
One of the shelter areas is found on the first floor level in the newly created multipurpose space. This space, fitted centrally between three existing concrete structures and with a second floor above it, becomes a natural, well shielded core shelter. Matching present construction, the architect has used reinforced concrete for construction of all new facilities, and the design concept is one of massive, exposed concrete forms. This situation enhances the radiation protection. Also, a depressed floor in the multipurpose space, designed to permit flexibility of use as a proscenium theater, theater-in-the-round, informal group gatherings, or cafeteria dining, is a definite benefit to radiation shielding of the space. A concrete wall at the north, provided to serve as a stage backdrop for the multipurpose space, is ideally positioned as a baffle to shield the shelter area along its weakest wall. Radiation exposure along the north wall is further reduced by a raised planting area which was introduced for visual strengthening of the entry from the administration unit. First floor space, with a protection factor of 40 or more, actually extends beyond the new multipurpose core into several other spaces, including flexible teaching-study areas of the 1925 building. The complex floor plan makes difficult the precise definition of acceptable protected space. A conservative evaluation indicates a shelter occupancy of approximately 875 persons on the first floor.

The other shelter area is found on the ground floor level. The sloping site results in only one or two exposed walls at this level, with the other walls set into grade. In his scheme, Kear has joined the lower floor levels of the 1925 original building and the 1965 classroom addition by adding new construction in the 35 feet which separate them. A large part of the ground floor area, used for the compensatory education program and general storage, provides fallout protection. A shelter occupancy of slightly less than 500 is possible. Here, again, because of the school's location partly against grade, concrete enclosure walls and several floors of concrete above, all shielding is inherent and required no construction modifications to achieve.

The fallout protection gained in this building represents one of those infrequent situations when a total building occupancy can be sheltered without changing any design or construction concepts. Still, the protected space is designed for daily educational use. It is important that these situations be acknowledged. Also to be noted is that all of the shelter space in this new facility is achieved completely within the new and renovated construction. Surveys indicate that no shelter exists in the present school.



FIRST FLOOR SHELTER AREA



GROUND FLOOR SHELTER AREA

AREA SUMMARY

Existing Schoolhouse	**74,120 sq. ft. total**
(Including 1935 Building and 1965 Classroom Addition)	
Ground Floor	15,539 sq. ft.
First Floor	30,622 sq. ft.
Second Floor	17,133 sq. ft.
Third Floor	10,826 sq. ft.
Proposed Schoolhouse	**97,920 sq. ft. total**
(First Phase)	
Ground Floor	16,753 sq. ft.
First Floor	43,284 sq. ft.
Second Floor	22,592 sq. ft.
Third Floor	15,291 sq. ft.
Construction Removed	**5,245 sq. ft. total**
New Construction	**29,045 sq. ft. total**

ESTIMATED CONSTRUCTION COSTS

Demolition of Existing Construction	$ 61,402.00	
Remodeling of Existing Buildings and New Construction	957,872.00	
Total Estimated Construction Costs	**$1,019,274.00**	**$10.40/sq. ft.[1]**

[1]Based upon total floor area of redesigned schoolhouse.

A satisfying and enriching aspect of this study has been the contributions of ideas and effort from among the best informed and most capable figures in the educational and architectural fields. Two persons, both with the Bureau of School Planning of the California State Department of Education, warrant special recognition, since their influence and ideas in the preceding pages are less visible than are those of the participants whose schemes are shown. Without holding either accountable for the contents of the study, whose ultimate responsibility is the Program Director's alone, these two, one an educator, the other an architect, have been the principal advisors to this study . . . and its most severe critics . . . guiding, inspiring, challenging and discussing.

Charles Dana Gibson

Clair L. Eatough

CHARLES DANA GIBSON, Chief, Bureau of school planning, California State Department of Education, contributed to this study not only the realities of educational change with its influence on California's schoolhouses but also a vision of what educational experiences might be. With a background as teacher, supervisor, principal and district superintendent, he has been with the California State Department of Education since 1943, serving as Chief of the Bureau of School Planning since 1958. Gibson served as President of the National Council on Schoolhouse Construction in 1953-1954, and as President of the Association of State Directors of Educational Plant Services in 1966-1967. He served as a member of the American Association of School Administrators' School Building Commission which wrote the book, *Planning America's School Buildings*, and contributed to the book, *Schoolhouse*, edited by Walter McQuade.

The American Institute of Architects elected Gibson as an honorary member of that organization in 1963. The California Council of AIA presented him with their Certificate for Distinguished Service to Education and School Architecture in California. In 1967, he was selected as the recipient of the first Educational Facilities Planner of the Year Award by the National Council on Schoolhouse Construction and the magazine, *American School and University*.

In 1967, Gibson was a guest of the Czechoslovakian government and addressed the World Conference of the Union of International Architects in Prague. He also exchanged information with school facilities planners on a tour through Spain, Switzerland, Sweden and England.

As an internationally recognized figure in the field of school lighting, Gibson has written extensively on the subject and, in 1956, was elected as a Fellow in the Illuminating Engineering Society.

Charles Gibson has demonstrated his continuing concern with the improvement of schools through his participation in this study effort.

CLAIR L. EATOUGH is the staff architect with California's Bureau of School Planning. His participation in this study carried with it a broad view of the immediate needs of schoolhousing in California as well as across the Nation. A more important contribution, however, is his ability to articulate the uncountable pieces of information coming to the Bureau into a meaningful perspective of the future schoolhouse. That perspective was the "carrot" he displayed before the other participants of this study.

Eatough came to the Bureau of School Planning in 1961, following several years of private architectural practice in Sacramento. A graduate of the University of Southern California's Department of Architecture, he also attended American University in Biarritz, France, and City University in Paris. He has devoted almost his entire professional career to schoolhouse planning.

Numerous publications produced through the Bureau of School Planning were, in fact, authored by Eatough. His analytical methods for problem analysis have made these publications valuable not only to education within the State of California but also to education throughout the Nation. Among pertinent publications are *School Site Analysis and Development* and *Cracks in the Belfry*, a summary of State legislation regarding schoolhouse design for seismic loadings and the implications of this legislation on schoolhousing in California.

THE BUREAU OF SCHOOL PLANNING was established by the California Legislature in 1927. In 1945, it was organized into the Division of Public School Administration, Department of Education, and made directly responsible to the Superintendent of Public Instruction.

The Bureau aids local school districts with programming and planning school facilities. Its duties are to improve design standards and make school facilities more appropriate to education needs. This agency exercises limited jurisdiction over all but 41 of the 1,243 California school districts. In recent years, approximately 60% of new school construction under Bureau jurisdiction has been built with State-aid funds, 30% with district funds, and 10% with Federal monies. The Bureau of School Planning:

. . .assists school districts in the selection of school sites by utilizing professional evaluation procedures.

. . .informs architects and school planners about changing trends and innovations in education and school design.

. . .makes attendance projections and reviews plan proposals within the restrictions of cost and area allowances for school districts utilizing State-aid funds.

. . .guides districts through all phases of educational planning from determination of housing needs and evaluation of preliminary design proposals to final plans and specifications, during which Bureau consultants advise about critical planning decisions and make recommendations.

. . .establishes standards for school facility design.

. . .evaluates existing and proposed school facilities against established criteria.

. . .conducts or supervises research projects, publishes significant reports, and presents regional workshops for school officials and architects.

When a school district is confronted with the need to purchase a site, employ an architect, or program and plan school facilities, the Bureau makes available a planning consultant who: guides this district in programming educational facility needs; evaluates preliminary plan proposals, and advises about bidding and construction. The Bureau of School Planning considers its service to be a continuing extension of the administrative service of each school district. A planning team is substituted for the historical approach which found architects planning school buildings in isolation from educators and technical resource people. In most projects, the nucleus of the planning team is the district staff, the architectural staff, and the Bureau of School Planning field representative.

The Bureau has an overview of schoolhousing in California and the Nation. As a clearing house for school planning ideas, it can make available to any school district the composite experiences of many school districts. This represents a unique and valuable service in aiding architects and school officials to achieve better schoolhousing design.

THE OFFICE OF CIVIL DEFENSE, in developing a nationwide fallout shelter system, seeks to create professional competence for the design of fallout protected space. Training and consultative services on shelter design techniques for those engaged in the design of buildings are among programs established to develop this professional capability. An understanding of these techniques by building designers is essential if fallout protection is to be created in functionally and economically acceptable ways. Courses in shelter design and analysis are offered to architects and engineers who then can make this service available to their clients. The Office of Civil Defense also makes professional advisory services available to architectural and engineering firms in the form of advice and guidance in techniques for gaining fallout protection in new and altered buildings. This service, called the Professional Advisory Service Program, aims at insuring the availability throughout the Nation of informed guidance on economical application of fallout protection principles whenever sought by building owners, architects or engineers. Professional advisory services may be requested through local, State or regional civil defense offices.

The manner of gaining fallout protection for the six schools shown in this publication illustrates the concept of professional advisory services at work. Designers were given a basic background in fallout protection techniques, and technical guidance was provided for application of techniques to the six specific situations through a team approach. This represents a valuable service in aiding architects, engineers and building owners to achieve the most appropriate and economical fallout protection.

In retrospect and in prospect

Education is a necessary part of our future. That is the beginning premise, unquestioned by all, which constantly directs our efforts to create the best possible educational environments for our youth. Limited only by our resources, the "best" should mean best methods, best equipment, best teachers and best facilities. These aspirations guide today's educators and planners as they look to the future.

As with all institutions of our society, education has its particular problems in attempting to achieve the best possible environments for teaching and learning. One of these is the problem of existing facilities, outdated, unsound, or otherwise substandard. Probably, there is no single, all-encompassing solution to this problem, for today's new schools inevitably will be tomorrow's outdated facilities. Fresh thinking and new ideas on meeting the challenge of upgrading these schools, therefore, can never be out of place.

To plan for the future implies the belief that there will be a future — a peaceful, prosperous and comfortable future. But education has nurtured not only the tools and means for achieving this kind of a future but also the means for threatening it. The threat of devastation by nuclear force is one result of our technology which must be acknowledged and reckoned with. The preferred solution is that we direct our collective energy only to those social and political programs which appear to lead in the direction of peace, prosperity, and respect for man . . . and that we encourage other world powers to do the same. But, the actions of other powers are not within our control, and we would be naive to believe that we can so direct others. It seems, therefore, that we are obligated to safeguard against all possibilities even though directing our principal effort to preferred goals.

Protection from hazardous fallout radiation, potentially the widest spread threat of the nuclear age, is the most effective insurance for the future that can be acquired with a modest commitment of resources. Better safeguards are possible; they also are costly. The educational systems of this Nation have accepted the responsibility to safeguard their students against the hazards of weather, fire, tornadoes and earthquakes. Indeed, this has become a legislated obligation in many States. Now, a challenge arises to provide safeguards for the students and others against an entirely new hazard — fallout radiation. Clearly, this is not a responsibility just for our school systems, but, as an essential part of our democratic system, school systems must accept some responsibility for the preservation of democracy. It is pointed out in the first pages of this publication that schoolhouses are well located in our cities and suburbs to provide needed fallout protected space and thereby contribute in a special way to this preservation.

The two principal objectives of this study, thus, are framed. One is to contribute fresh ideas for improvement in existing educational housing; the other is to clarify the implications in providing fallout protection in schoolhouses. These two objectives were pursued together rather than separately, for many of us believe that an integration of the two separate objectives is both possible and feasible without serious compromise for either. The six studies shown within these pages seem to validate that belief. The six projects selected for study are real; each will undergo physical upgrading in the next few years along the guidelines suggested in the separate programs. The educational proposals for these schools would not be altered if fallout protection were discarded as a design consideration. That, we believe, is as it should be. Compatibility of educational functions and fallout protection is possible under a comprehensive and integrated approach.

We are not suggesting by these examples that fallout protection is to be gained in schoolhouses without some commitment. Sometimes that commitment takes shape as design effort; sometimes it is dollars. Sometimes it is both. We are suggesting, however, that coordinated design approaches can reduce to modest levels the financial commitments for gaining the desired fallout protection. Our findings on shelter construction costs for these study projects, with two exceptions, fall within the cost pattern of $25.00 per shelter occupant, suggested by the Office of Civil Defense as a comparative base. Those exceptions are the small, one-story buildings which normally would be wood frame construction, a situation known to be difficult before we undertook the study.

The study represents an effort to contribute new ideas as well as to clarify misconceptions, both for educational facilities planners and for architects. An underlying satisfaction is that the study has done this for the author, which was not an initial consideration. We at the University of Utah are appreciative of the contributors to this undertaking — the educational facilities planners, the visiting architects, the school district administrators, the special consultants, the sponsors of the Office of Civil Defense, and, in particular, 30 enthusiastic students.

DELBERT B. WARD
Program Director
Summer, 1968

U.S. GOVERNMENT PRINTING OFFICE : 1968 O—320-832

Acknowledgements

Other contributors to this design study and to this publication were numerous and, I believe, the best in their respective disciplines. Their efforts and contributions are acknowledged with pride.

Design Study Assistant Director:
JOHN GIUSTI, Lecturer
Department of Architecture
University of Utah

Educational Facilities Planning Consultants:
DR. WILFRED CLAPP
Formerly with Michigan Department
of Education

DR. HAROLD CRAMER, Director
School Plant Planning Section
Florida Department of Education

CLAIR EATOUGH, Architect
Bureau of School Planning
California Department of Education

JAMES THEODORES, Staff Research
Council of Educational Facilities
Planners

Distribution

Chief State School Officers
Deans of Architecture
Deans of Engineering
Instructors Qualified in Fallout Shelter Analysis
National Association of Independent Schools
National Education Organizations
OCD Regions, Staff College
State CD Directors